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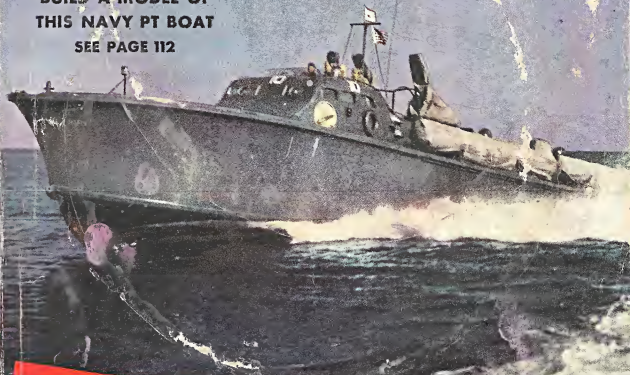
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MECHANIX ILLUSTRATED

MARCH
1942

Volume XXVII
Number 5

W. H. FAWCETT, JR., President

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ARCH
WHITEHOUSE

Few aviation writers have had the background enjoyed by Arch Whitehouse, whose article, "The Battleship Is Sunk," appears on page 35 of this issue. As an officer in the Royal Flying Corps in the last World War, he was officially credited with downing 16 enemy planes and six balloons. He has followed military aero-nautics consistently since he was demobilized from the R. A. F. in 1919 and in the interim has written more than ten million words on the subject of aviation, including two major books on military aviation. His stories appear frequently in *The Saturday Evening Post* and his most recent serial in that magazine, "Spitfire Squadron," has been purchased by 20th Century-Fox Films to be made into a movie. He is considered an expert on modern air gunnery and has been consulted by designers on the subject. The U. S. Navy recently invited him to make a tour of inspection of the North Atlantic Fleet.

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54 PAGES OF HOBBIES AND HOW-TO-BUILDS STARTING ON PAGE 93
On The Cover: U. S. Navy PT Boat—Kodachrome By Rudy Arnold.

ROBERT HERTZBERG, Editor

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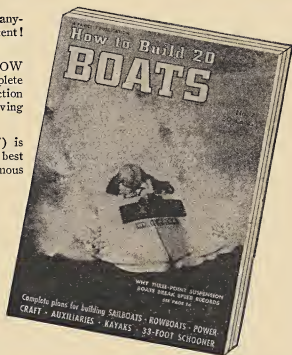
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NEW PRODUCTS AND INVENTIONS

LATEST HOME AND SHOP DEVICES • POPULAR PATENT IDEAS

GOSSIP OF DEFENSE AND INVENTORS

by Morton Leese

MOST of us who studied physics in high school know a little about the process of distillation. Anyway, we know that if we mix alcohol with the water in the radiator of a car, the alcohol will boil off first. Oil companies use this principle in separating various petroleum products—the different boiling points causing the more volatile substances to boil off first.

A large amount of toluene, basis for TNT, has been lost up to now in petroleum, because it had



The giant floodlight bulb this young lady is holding is a new type recently developed for industrial plants, auditoriums, and stores with high ceilings. The new bulb is said to deliver a concentrated flood of light that cuts through haze and smoke to provide brilliant illumination. The 1500 watt size is shown. Twelve smaller sizes are also available for use.

the same boiling point as several other chemicals, and thus could not be separated by distillation. Dr. Frederick W. Sullivan Jr., a Standard Oil chemist, recently found that by adding crotonaldehyde to the petroleum mixture, a fairly wide difference in boiling points was established, enabling the distillation process to separate the toluene. The process was granted patent No. 2,265,220. Uncle Sam can make himself a lot more TNT now.

Back in 1939, a German citizen by the name of Rudolf Gebauer applied for a U. S. patent on a new type of altimeter which utilized cosmic rays. It's a known fact that cosmic rays increase with altitude. Scientists have made recordings to prove it. Herr Gebauer figured that a cosmic ray registering device in a plane could give an accurate reading of altitude up in the stratosphere; where

Made of latex sponge rubber, this newly introduced military parachute seat contains thousands of small air cells. The valve in the side permits the wearer to adjust the air pressure within the seat at high altitudes.



ordinary altimeters lose some of their accuracy. He made his patent application just a month before the present war broke out, and assigned his patent to a Berlin concern. But now that Germany and U. S. are at war, and Gebauer's patent No. 2,265,966, has been granted, Uncle Sam can seize the invention and use it in his own planes.

A Frenchman, Leon Emile Remondy, of Reuil-Malmaison, invented a percussion fuse for artillery shells back in that same fateful year of '39. He too applied for a U. S. patent on his device before the war broke out. But since then Leon Emile Remondy passed on. Now that the world is embroiled in history's most terrible war, that patent, No. 2,265,195, has been granted—to its dead inventor's estate representatives. It's a simple design—looks like a wide headed nail. But it's packed with destruction. The head of the nail-like fuse is thin and very brittle. It's so brittle, in fact, that it will shear off and drive its little spike into a detonating pellet on the slightest impact. The thin fabric of an airplane wing, or the soft mud of a swamp is enough to operate this fuse. Ordinary shells don't always explode in such materials. There are instances of explosive shells passing clear through hydrogen-filled Zeppelins without going off. This fuse won't fall that way.

[Continued on page 152]

This modern wall type electric heater has just been announced. No exposed hot wires or glowing elements of any kind are to be found in it, a new type of electric safety element provides the heat. A quiet motor-driven fan distributes the warm air evenly.



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Our "Patent Guide for the Inventor" answers many important questions concerning Patents that inventors constantly ask. It tells what facts, details, drawing, sketches, etc., are necessary to apply for a Patent; how to protect your invention through dated and witnessed disclosure; how to do this AT ONCE to safeguard your rights; how Patent Office Records can be checked to determine whether the invention is probably patentable before filing fees need be paid; discusses costs involved and a practical way these can be paid as the application progresses. It tells how some inventors secured financial backing; how many simple inventions have proved large commercial successes; how Patents covering improvements also can be profitably utilized and marketed; tells countless other facts of interest.

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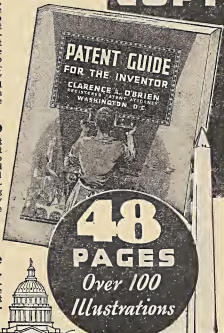
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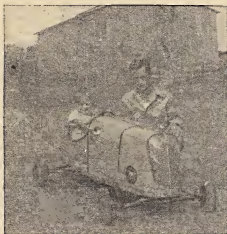
Chips from the EDITOR'S WORKBENCH

BY THIS time, it should no longer be necessary to remind the old settlers among you of our age-old campaign to get people to turn to workshop activity as a means of getting their minds off the world's troubles. As you know, we've been saying for months that the best way to avoid a nervous breakdown is to get a hobby.

Well, we think we can scuttle that campaign now; it's no longer necessary to tell people to take up handicraft. They're going to take it up in ever increasing numbers from now on. With the country at war, and our pleasures and luxuries limited in so many ways, you're going to find there's very little else to do. Tires will be rationed, meaning we'll have to give up the family car; golf balls will be scarce, eliminating that divertimento; private flying for the fun of it is, of course, definitely out, and almost every other pleasure imaginable will be curtailed (even if it isn't, no one's going to want to make himself obvious by appearing to enjoy himself while the rest of the country sweats blood to



This is the *Cinderella*, a 93-inch-tall, 56-inch-long model sailboat built from MECHANIX ILLUSTRATED plans by Ralph W. Graf of 2516 Spencer Place, Overland, Missouri. Mr. Graf did all the work in six months of spare time at a total cost of \$8.00. "As the MI description says," writes Mr. Graf, "she sails like a little princess." Plans for the *Cinderella* can be obtained by writing Fawcett Publications, Greenwich, Conn., and asking for Blueprint No. 302. The price is \$1.50. We are sending Mr. Graf a \$5.00 Workbench check as an award for his neat, professional-looking work.



Ewell Riddle, of Stamping Ground, Ky., built this trim little "1942 Model" roadster for the youngsters. Powered by a Briggs & Stratton 1/2 h.p. lawn mower motor, the little car has a top speed of 15 miles per hour. The sprockets may be changed to hold the top speed down to 10 miles per hour, which should be a safe driving speed even for the little beginner shown at the wheel in the picture. The tires are 10x2.75, and the springing arrangement transverse as in a Ford. Another feature that puts this little job right in the field with the full-sized cars is the hood, which is hinged to lift up just the way the latest models do. Mr. Riddle gets a \$3.00 Workbench Award and a Workbench Certificate of Merit for this sleek little miniature automobile.

win itself a war! That just isn't cricket).

So, if you know a friend who's worried about what he's going to do to kill his spare time, pass along your copy of MI to him; he'll appreciate your bringing it to his attention, and you'll get a kick out of having a friend interested in the same things you are.

* * *

INCIDENTALLY, some of you folks have been writing to get copies of the February issue so that you'd be sure to be in on the big MI contest. If you've been doing that, forget it. You don't have to have a copy of the first contest issue to be eligible for a prize; you'll find the February contest blank and puzzle printed with the March one on pages 76 and 77. Just clip out both of them and save them till you get the third one in April. Then fill 'em all out and shoot them in to us. We'll do the rest.

[Continued on page 14]

America Can't Wait Industry needs you NOW

Defense Program Needs Trained Men

There is a tremendous shortage of skilled men in almost all branches of industry. Draftsmen, electricians, machine designers, machinists, are wanted for good jobs at fine pay. Executives, too, foremen, superintendents, managers, are needed right now to handle the enormous demand for finished products of all kinds. If you are already in one of these fields, you owe it to your country, to your family, and to yourself to make yourself even more valuable, to climb and climb fast and help put through the most important program we have ever had to face.

Opportunities Everywhere

Home building, ship building, manufacturing plants, great utility projects, road building—everywhere you look you find a demand for men—not just ordinary workers, but men who know more than their fellows, who are better at their jobs, who know both theory and practice and can therefore train other men, thus rising to more and more important stations and being of greater and greater help. Practically every industry is included in those needing MEN, trained men, skilled men, men with ambition and punch.

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[Continued from page 12]

And, another thing: some naturally worrisome souls have been inquiring about the plane we're donating for first prize in the contest. They want to know how—if the government is limiting private flying—they're going to get any enjoyment out of winning an airplane.

Well, we can answer that one easily. In the first place, the war isn't going to last forever; it probably won't end before this issue reaches the newsstands, and it probably won't end before our contest does. But it will end—you can be sure of that—and when it does, if you're the lucky winner of our contest, you'll have yourself an airplane (and bear in mind the fact that, in the opinion of experts, we're going to have the greatest boom in private flying after the war that anyone has ever dreamed of; it's going to be just like automobiles were after the last war, so you'd better get yours now!)

* * *

WE HAD a very touching letter from a lady recently, a lady whose name we won't mention for the simple reason that her name isn't important. She wrote to us to ask if we could help her locate her brother, who had left home eight years ago and hadn't been heard from since; and the reason she enlisted our help is that she

[Continued on page 16]



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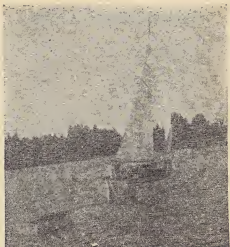
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A real job on the 20-foot plywood, auxiliary cruiser, *Pixie*, made from plans in *How To Build 20 Boats*, is shown in the photograph above. She is the work of S. W. Ostrom, 2714 8th Ave., Milwaukee, Oregon, who says he laid the keel on March 4, 1941, and launched it on May 24. "That certainly speaks well for the ease of following your plans," he writes. Plans for the *Pixie* may be obtained by sending \$3.00 to the Fawcett Publishing Co., Greenwich, Conn., and asking for blueprints No. 928. Mr. Ostrom reports that the dingy shown in the picture is also made from Fawcett plans. For his work and his snapshot, we're making him a \$3.00 Workbench award.

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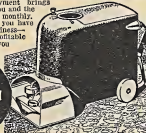
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Editor's Workbench Chips

[Continued from page 14]

had seen, in one of the photos appearing in MI, a gentleman who looked enough like her long-lost brother to be his twin.

The point of the story, however, is that the lady apologized profusely for putting us to so much trouble. She seemed to feel that we were going to be terribly put out because we had to search in our files and write to authors to see if we could learn the name of the gentleman in question. As a matter of fact, we did have to go to a bit of trouble, but in a case of this kind, it was a pleasure. That's what we're here for—to help you readers. And if we can be of service—whether in finding your long lost brothers or digging out the plans for some project you saw in an old issue of MI, for heaven's sake, write to us. If we can't help you, we'll say so.

But give us a chance anyway.

* * *

AS USUAL, we'd like particularly to call your attention to several of the features we've rounded up for this issue. (We know you don't have to be led around by the hand, but we mention these particular stories because we think they're definitely significant.)

First, there's the yarn beginning on page 35, "The Battleship Is Sunk." This, we believe, is an authoritative analysis of the battleship and



The husky young fellow seated between the two miniature locomotives is Mr. L. C. Knapp's grandson, L. C., himself, who lives at 911 E. Fulton St., Michigan City, Ind., is a World War veteran who builds model locomotive as a hobby when he gets some spare time in his radio repair business. His two models shown in these pictures are both live steamers, made entirely by hand to perfect scale. When the steamliner is fully completed Mr. Knapp tells us it will be radio controlled. Moreover, it'll even have air brakes. The cylinder bore is 3/8 inch, and the stroke 1 inch. What appears to be a crate on the rails ahead of it in the lower photo is really a pack of cigarettes. Mr. Knapp gets a \$3.00 Workbench Award and Workbench Certificate of Merit for his fine work on these two models.

Editor's Workbench Chips

the role it will play in the warfare of the future. Written by Arch Whitehouse, a veteran of the first World War and a former RAF pilot, it points out some significant weaknesses of the battle-wagon, weaknesses which a nation at war can't continue to ignore. In spite of this fact, the article is not written in any critical sense, but rather in one of helpfulness and suggestion. Mr. Whitehouse, like us, is patriotically "all out" for an Allied victory.

The significant point about it, however, is that Mr. Whitehouse's piece is followed by one written by Douglas Rolfe, also a former RAF flyer, who, on pages 40-45, outlines the trend of future warfare along the lines Mr. Whitehouse suggests. Lt. Rolfe, who wrote his story sometime before the attack on Pearl Harbor, brings out the fact that most modern battles will be waged in the skies, far above the land for which the combatants are struggling. He envisions aerial "battleships," "cruisaires," "destroyaires,"

[Continued on page 18]



Mr. J. Bernard Donegans, of Mineral Ridge, Ohio, liked the lines of *Honker*, a hunting skiff in HOW TO BUILD 20 BOATS No. 5. He also liked the metal construction of *Zinky Dink* in HOW TO BUILD 20 BOATS No. 6. Mr. Donegans did the logical thing—he built an all-metal version of *Honker*. "I think this boat has brought me the greatest pleasure for the least expense of anything I have ever had," says Mr. Donegans.

The currier, by means of which the boat is transported atop the builder's car is also a novel job with a roller to facilitate easy one-man loading and unloading. The cost of the items as submitted by the builder follow:

Boat	\$10.69
Oars and locks	2.67
Carrier	5.45
Used 2 H.P. motor	15.00

In conclusion, says Mr. Donegans, "I wouldn't sell this for \$100." In addition to the pleasure he derives from his boat, this enterprising builder now gets some cash return in the form of a \$3.00 Workbench award—also a Workbench Certificate of Merit.

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Editor's Workbench Chips

[Continued from page 17]

and other mammoth fighting ships of the clouds.

And, lest you think the lieutenant is talking through his hat, all you have to do is turn to page 45 for a photograph of an actual air giant of the general species Rolfe has in mind in his artist's drawing on pages 40 and 41. In other words, this isn't fantasy; this whole story is based on actual fact!

So take our advice and read it; it'll be worth your time and effort, if any.

* * *

BY THE way, on our cover this month, you'll notice a Kodachrome of one of the Navy's fast little PT "mosquito" boats in a test run along the New Jersey coast. We hope you like this



A delayed action shutter release on Leo W. Gray's camera took this picture of Leo and his 20 model planes. Young Mr. Gray's home on Route 1, Box 33, White Rock, N. J., must certainly be the scene of constant industry if those models are characteristic of his production methods. There's a tailless job on the left, and that's a real credit to his ability, as it's no easy task to get a ship like that to fly properly. Another model is a military ship which is metal covered, and complete even to the rivet heads. For his outstanding mass production model plane job, Mr. Gray gets a \$3.00 Workbench Award and a Certificate of Merit.



Aural Robedaux, of 701 Quinny Ave., Kaukauna, Wis., is the builder of this cleverly constructed miniature automobile. Powered by a washing machine motor, the little car has a top speed of 20 miles per hour. A novel innovation in miniature car construction is the use of plywood for the enclosed body of the car. By using this material, miniature auto builders can overcome any difficulty brought on by wartime restrictions on metal. For his novel idea in building this little vehicle, Mr. Robedaux gets a Workbench award of \$3.00, and a Certificate of Merit.

Editor's Workbench Chips

cover, because our photographer virtually had to appear before President Roosevelt before he was permitted to take the picture.

We also hope you like it because we're running the plans in the How-To-Build section telling you how you can construct a model of the PT in your own workshop. (Note: These plans began in the February issue and are continued in this issue, but in case you get stuck, you can obtain a copy of the February issue by sending 10 cents to Fawcett Publications, Greenwich, Conn.)

* * *

WE THINK you'll be interested in a letter we received recently from Watson Davis, director of Science Service, Washington, D. C. With his letter, Mr. Davis sent along a little

[Continued on page 20]



This professional looking lawn mower power conversion is the work of Glenn Huston, of 1739 31 Ave., N., St. Petersburg, Florida. The thing works beautifully and certainly saves a lot of trouble with very little expense, according to Glenn, who writes, "I can mow my entire lawn in about an hour on only a half pint of gas." He goes on to say that anyone with a little mechanical ability can convert their own lawn mower into a power driven machine. That sounds easy, and encouraging. This snapshot brings Mr. Huston a \$3.00 Workbench award and a Workbench Certificate of Merit.



Jerry Lundin, of Paradise, California, built this beautiful XP-3 gas model plane. "Over two hundred people turned out to witness the trial flight," Jerry writes. "Much to every one's astonishment, the first flight was an out-of-sight flight!"

He goes on to say that the timer stuck, allowing the engine to use up the entire tank of fuel. Fortunately the plane was located a short time later in a cow pasture five miles away. It's sure a beauty. Model fans who'd like to build an XP-3 may secure a pamphlet containing plans and instructions, for 25 cents. Address Fawcett Publications, Greenwich, Conn., and enclose check or money order. This snapshot brings Mr. Lundin a \$3.00 Workbench award and a Certificate of Merit.

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Editor's Workbench Chips

[Continued from page 19]

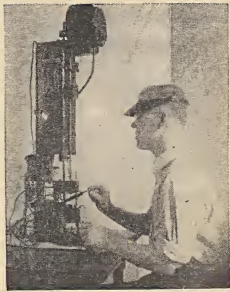
piece of rock which he said was "bauxite," the mineral from which we get aluminum and for which troops were sent last fall to take over the mines in Dutch Guiana.

"We could tell you exactly how to clean this spoonful of bauxite," Mr. Davis writes, "how to digest it, filter it and perform the electrolysis that produces the highly-prized aluminum. But the job would just mess up your desk, and you would have only a quarter-teaspoon anyway, which would barely make a propeller for a toy airplane. So just keep the sample so you can show your friends what all the shouting (let's hope it's not shooting!) is about."

So, although we can't show each one of you what all the shouting's about, we can tell you. And we can tell you that, just on its face values, the thing doesn't look worth the effort. It's just a piece of rock to us.

WE ALSO received in our mail this past month a letter from William K. Walthers, of Milwaukee, in which he tells us about the patent he's just received on a new method of construction for model railway locomotives.

Briefly, as nearly as we can see it, Mr. Walthers'



Mr. George Coffey, of 203 Roosevelt Street, Providence, R. I., is the inventor of the headless-machine-screw napper which he is shown operating in the photo above. The device eliminates the need for feeding the screws to manufacturing machines by hand, and Mr. Coffey tells us further, "... there isn't any other device as yet to serve the purpose." It sounds like a worthy industrial advancement, and one that may well prove profitable. For his unusual and useful invention, Mr. Coffey receives a \$3.00 Wankench award and a Certificate of Merit.

Editor's Workbench Chips

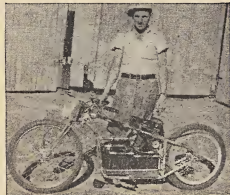
plan envisions the use of an independent gear mounted on each driving axle so as to eliminate the excessive friction of driving through side rods. The construction also is centered around the use of a number of standardized parts which can be fitted together to assemble locomotives of 14 different wheel arrangements.

"My experience in the model railway field,"

[Continued on page 22]



Young Bill Hebestreit, of 1718 N. Lockwood, Chicago, Ill., is shown above with his 54" wing-span gas model. It's his third gas powered model plane, and was designed and built by him in nine days. Although the little ship has made more than 100 flights, it has broken only two propellers and one wing tip—and that's an unusually good record, particularly when there are a few trees around. Bill's broken wing tip came from another model plane hazard—telephone wires. He tells us in a postscript that his mother "bates" airplanes. Maybe she's afraid Bill's going to try to take off in one of his models, but it looks as though he's going to be a designer instead of a pilot. This photograph of his third model plane design brings him a \$3.00 Workbench award and a Workbench Certificate of Merit.



Here's an all-electric bicycle, the conception and work of R. L. Watson, 1817 M Street, Sacramento, Calif. It uses a reformed Ford generator and two 6-volt batteries, with a switch made from a Chrysler starter switch. Mr. Watson says it will run five to seven hours on a charge at 15 to 18 miles an hour, the performance varying with the work done. The frame is thin electric conduit, which is quite soft but, according to Mr. Watson, seems to stand up well. Mr. Watson wants other Workbenchers to check up on the cost of a license in their state before building one for themselves. We're sending him a \$3.00 Workbench check.

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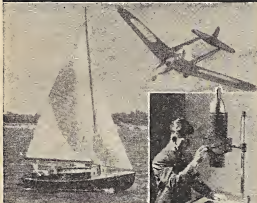
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Editor's Workbench Chips

[Continued from page 21]

Mr. Walthers says, "leads me to believe that the average man finds it difficult to properly fit side rods so they will transmit power without binding. I have also found that the individual unit drive, made possible with my 'polydrive' idea, makes for a more efficient and powerful locomotive."



William R. Efferding, of R. R. No. 6, Maquoketa, Iowa, built this beautiful little windmill tool house from plans and instructions in the May, 1941 issue of **MECHANIX ILLUSTRATED**. "The plans are easy to follow," writes Mr. Efferding, "and make something useful as well as ornamental." (Thank for the compliment—we try to make all our plans easy to follow.) Mr. Efferding made an excellent job of this project judging by the snapshot. His skill brings him a \$3.00 Workbench award and a Certificate of Merit.



Charles G. Murthy, of 8941 Albemarle Drive, Merrimack Park, Norfolk, Va., built this collection of home decorations. Plans for them were contained in the August and September issues of **MECHANIX ILLUSTRATED**. The ribbon in the foreground carries a growing narcissus bulb, and is drawn by a plywood Chinese conia. On the left is a little Dutch girl—jigsawed 1/8" plywood. She holds an appetizer tray. In the background is a large circular whatnot shelf.

These projects were certainly turned out nicely by Mr. Murthy. All the more credit is due him in consideration of the fact that he had very few tools to work with. The coping saw with which the work was done cost him 35 cents. A hammer was about the only other tool used. A \$3.00 Workbench Award and a Certificate of Merit goes to Mr. Murthy for his handiwork.

Editor's Workbench Chips

So, if you're contemplating building a model, you'd do well to get in touch with Mr. Walthers, in Milwaukee. His street address is 241 East Erie Street.

* * *

ONE thing more: The Norman W. Henley Company, publishers of a variety of books of interest to the workshop fan, including works on Diesel Engines, Electricity, Aviation, Automobiles, Machinery and Plumbing & Heating, have announced that a new catalog of their various publications is now available, and will be sent free to anybody who requests one. If you want one, write to them care of The Norman W. Henley Publishing Co., 17 West 45th St., New York, N. Y.

* * *

WANT to stay young—mentally? If you do, you might try following a set of rules recently drawn up by Dr. George D. Stoddard, University of Iowa psychologist, to prevent the too rapid approach of mental old age. Dr. Stoddard's regulations consist of:

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2. Avoiding the "mechanisms of escape from life and reality"—retrospection and rigidity.
3. Avoiding lack of mental exercise—failure to

[Continued on page 25]



This beautiful radio end table and the radio inside of it were built by Russell A. Pinnell, of 229 Schaeffer Street, Brooklyn, N. Y. It took three weeks of Mr. Pinnell's spare time to complete the work, but judging by the appearance of it, its efforts were well rewarded. The woods used in the construction were white pine, spruce, and three-ply maple. Finished first with varnish, then with wax, the surface of the table is almost glass-like. "I was greatly satisfied with the results of my efforts," writes Mr. Pinnell, "and felt my greatest reward would be to know if my efforts and craftsmanship are qualified to win a MECHANIX ILLUSTRATED Editor's Workbench Certificate of Merit from such a recognized authority." The answer is "yes." Not only a Certificate of Merit, but also a \$3.00 Workbench award goes to Mr. Pinnell for his excellent example of high grade radio and woodworking.



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Editor's Workbench Chips

[Continued from page 23]

undertake new abstract learning, as valuable to adults as to the young.

And, if the doctor doesn't mind, we'd like to add a rule of our own—get a good laugh now and then. It's all very well to try keeping young by avoiding retrospection and rigidity, but if you don't see W. C. Fields occasionally, you might just as well grow old and like it.

* * *

HERE'S one for the reader who is wondering how he's going to get around if the tire shortage becomes acute. (No, it doesn't involve bicycles; bicycles have tires too!) This gem is revealed in a patent issued recently to a man who has invented a motorized skate.

No fooling!

The darned thing has synchronized gasoline motors mounted on each skate, thus preventing one skate from going faster than the other and turning the user around in circles. A big arched hoop, extending out in back of the skater, keeps them in synchronization.

Now then, what's going to happen when some gay blade takes his girl skating and then announces, out on some lonely road, that he's out of gas? He can't tell her to get out and skate home because they're already on their skates!

The best thing, as far as we can see, is just to

[Continued on page 151]



This pretty little girl is the 17-month-old daughter of Mr. E. S. Tuthill, of Remsenburg, L. I., Box 55. Mr. Tuthill built that little lawn chair for her from plans in the July, 1941 issue of MECHANIC ILLUSTRATED. Although the plans showed the chair twice the size, Mr. Tuthill made this small version for his little girl by simply using half-size squares when working from the drawings in MI. That's a neat trick that anyone can do when he wants to make a smaller version of a project from a squared drawing. A \$3.00 Workbench award and a Certificate of Merit go to Mr. Tuthill for this snapshot.

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MARCH, 1942

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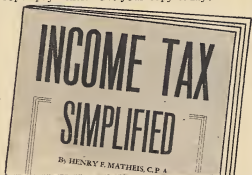
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Letters To The Editor

To the Editor:

This is the first time I have taken time to write to a magazine regarding its publication. However, I believe that **MECHANIX ILLUSTRATED** deserves any and all compliments that its readers can pay. And how you do it for the price is more than I can see.

I wonder if Mr. Baker could tell me, in connection with his article "Temper Your Own Drills," if the metal in the magnets of the old Model T Ford are of any value for making small tools and how to treat such. I have always been of the opinion that these magnets were of high quality steel as they seem hard and of very fine grain. So far my attempts to use them have failed. I would appreciate it immensely if either Mr. Baker or anyone else could give me more information on this. I'll be watching for more articles of this type, especially on small tool making.

Frank Seigler
2115 St. Anthony Ave.
St. Paul, Minnesota

We have written Mr. Baker regarding other uses for these small magnets and he tells us that all he knows about Ford magnets is that they're very nice to drag over the floor in hopes of finding dropped screws, pins, springs, and such things.

Try writing to Harry Ross, 70 Broadway, New York City. He should be able to give you information on all kinds of magnets.

To the Editor:

I read your feature, "The Facts on Tire Retreading," in the November issue with great interest.

My own tires will need retreading soon and this information has convinced me that it can be done with safety. Your article was very timely too, especially in view of the present rubber shortage, and I am sure many other people in the same predicament as I will decide to have their tires retreaded and feel confident.

Garrett E. Smith
4220 Alameda Avenue
El Paso, Texas

To the Editor:

Your article on defense jobs was shown to me and it is inspiring. I, too, would like to do my share in the national defense. I, too, would like to be able to buy Defense Bonds and Stamps. But I don't seem to be able to connect with one of these jobs.

Up until about 15 years ago I was a sheet metal worker and had plenty of experience in this line. I am told now that there is a shortage of these workers, and that women and girls are being put to work on these jobs. What is the trouble? Why is it that a man skilled in this line of work can't locate one of these jobs, even through the government employment agencies?

If I am not fit as a full-fledged mechanic, why can't I at least be put to work as a helper, with a helper's pay? Something must be wrong with the government's system, as it is obvious that men with my experience are needed.

Orlain Greenblatt
1428 Vyse Avenue
Bronx, New York

To the Editor:

I am a regular purchaser of **MECHANIX ILLUSTRATED** and get great enjoyment from reading your fine magazine. I am in the second year of high school and find that your magazine helps me in Auto Shop, as well as in my English class.

I do hope that you will publish more articles on bicycles as suggested by Fred Miller in the January issue; and also on midsize cut-down cars.

David Handley
Merced, California

To the Editor:

I was keenly interested in your "Whiz Kids" article published in the January issue of **MECHANIX ILLUSTRATED** magazine. I have had the notion for a long time of promoting just such a laboratory in Chicago, where I live, but until now I hadn't many good ideas. Your article helped bring some to mind.

I have some very good contacting connections in Chicago for setting up just such a laboratory and these

Letters To The Editor

[Continued from preceding page]

helpful hints will enable me to bring to a head just what I have been looking for.

J. S. Hyland
6220 South Ingleside Ave.
Chicago, Illinois

* * *

To the Editor:

Thanks very much for the \$10 check as first prize in your monthly photography contest. My son Bob was more than pleased with himself when he saw his picture in your January issue, and he practically has the copy worn out from carrying it around to show it to his friends.

My thanks again, and best wishes for the continued success of your very excellent photographic department.

Charles T. Beals
139 East Brown
Birmingham, Michigan

* * *

To the Editor:

I have not read many of your books but so far they are all whizzes. I'm going to get right to work on some of the many things that can be made from the plans in your January issue.

After I have a little more experience, my first big job will be that Utility Secretary—then the Two-One Wonder.

N. Gaglia
2414 Belmont Avenue
Bronx, New York

* * *

To the Editor:

As you know, there are numerous magazines that feature a magician whose miraculous feats are accomplished by pronunciation of magic words.

Most all people call this impossible, but making hands and feet appear out of nowhere and stopping objects in mid-air is possible and without hokus-pokus. This is done by concentration and will power. Every person has these powers, and when this power is realized, man can rightfully call himself master of the world.

Clifford Baker
Baltimore, Maryland

* * *

To the Editor:

After reading "You're Wanted—for a Defense Job" I decided that perhaps you can give me the necessary information to enable me to put my shoulder to the wheel and help along the defense program. But just where do I apply? Is it private industry or Civil Service who needs men?

I am certainly not lacking in experience. For the past twelve years I have been a house carpenter. Previous to that I worked in various machine and automobile factories on a lathe, milling-machine, drill press, gang drill, multiple drill, broach; I can assemble small machines, hydraulic pumps, and use micrometers and gauges. I had three years' experience as an inspector in an auto factory. Mathematics has always been a favorite of mine, and I'm able to read simple blueprints and working drawings.

Because of the higher mathematics it offered which I thought I needed, I also took an I. C. S. course in Machine Shops Practice.

For two and a half years I was in the Civil Service (Ordinance Department, Aberdeen Proving Ground, Maryland) during the last war, and honorably discharged.

I have registered in numerous State Employment Offices and find, as many others do, that they are "the bunk."

What else must I do?

It's my hope that this bit of your valuable time will not be wasted and that you can help me out. Meanwhile, I will remain one of the many who are able if given the chance.

John C. Evans
Oklahoma City, Oklahoma

We suggest the Office of Production Management in Washington as possibly another source of information. We also are of the opinion that Mr. Evans should register with the government for a Civil Service appointment.

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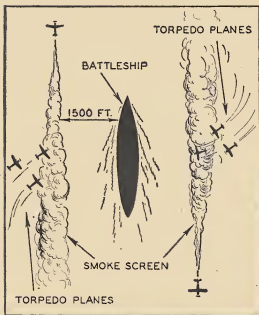
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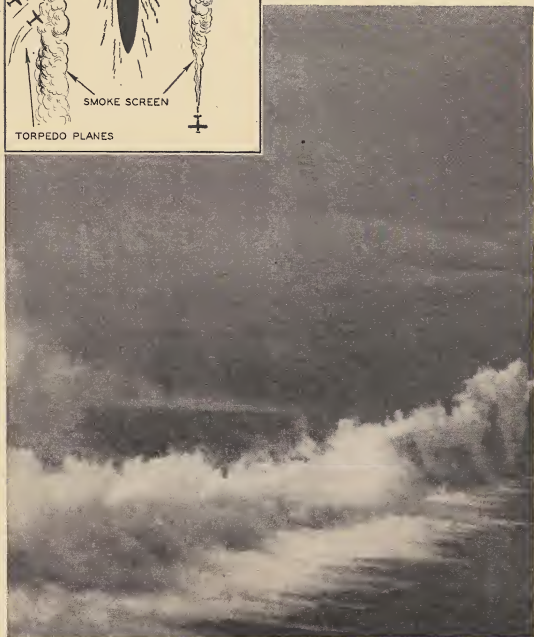
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Screened Torpedo Plane Attack



NEWEST technique of torpedo plane attack is pictured here. Torpedo squadrons are led by smoke-laying planes that lay down smoke screens, as shown in the picture below and the diagram at left, on either side of a battleship. The torpedo planes then fly through this screen to launch their missives. The ship's gunners have less than a second to fire upon them.



THE BATTLESHIP IS SUNK

A \$75,000 torpedo plane has destroyed a \$100,000,000 battleship, and thus sounded the doom of sea dreadnoughts.

by Arch Whitehouse

In this article, a noted authority on aerial warfare sets forth the final facts in the argument of "Plane vs. Battleship" and concludes that the battleship can now be considered obsolete. In the article immediately following, on page 40 of this issue, Lieut. Douglas Rolfe, R.A.F., famed aerial artist, shows you a design of the coming "battleship of the sky" and tells what we may expect in the way of aerial navies to supplant the navies of the sea.

BILLY MITCHELL was right! Nearly twenty years ago, General Billy Mitchell staged a demonstration off the Virginia capes that proved conclusively that aircraft could destroy a modern war ship. Mitchell's show had to be staged against an obsolete cruiser which was stationary, or nearly so, because at that time there was no war in progress where he could demonstrate under actual tactical conditions against enemy surface craft.

The fact that a handful of comparatively light bombs were deposited on and eventually sunk this obsolete cruiser, made no difference to the shellbacks among us, who would not see. Mitchell's demonstration was not spec-



Here is a torpedo plane in action—the nemesis of the battleship. This is the way the plane launches its deadly missile.



And here is the result: The huge dreadnought, Arizona, lays on the bottom of Pearl Harbor, victim of a \$75,000 Jap plane!





Hints of things to come appeared long before the war began! Here is a scene at an English airport in 1938, with an aerial torpedo being loaded aboard ship!



Rivals!—but both succumbed to superior might from the air! The British battlecruiser Repulse, above, went down, and the Japanese battleship Kongo, right, was put out of action.



tacular. It took some little time for the vessel to sink and several bombs intended for the deck of this obsolete cruiser missed!

General Billy Mitchell died a few years later, crushed and disillusioned, but certain in the depths of his heart that the modern dreadnought or battleship was doomed.

The writer has held all the belief possible as to the future of the military plane as an important factor in national defense, but at no time—until December 10, 1941—did he believe any airplane could actually and consistently destroy a modern battleship.

There is no question in the writer's mind today!

On December 10, the two British Royal Navy battleships, the *Prince of Wales* and the *Repulse* were blasted to Eternity in less than eighty minutes by torpedo bombers of the Imperial Japanese Navy!

One national weekly came out with: "It was the blackest day of the war for the British Navy and a supreme hour for the exponents of air-power throughout the world."

From this statement, one might infer that battlecraft had never been destroyed by aircraft.

Billy Mitchell and his Army bombers had done it almost two decades before!



Brig. Gen. William "Billy" Mitchell, the man who foresaw the battleship's doom.

The American public too, had smugly forgotten the battles at Taranto, at Cape Mataplan and in the Ionian Sea where British carrier-borne torpedo bombers doused whatever hopes Italy might have had for naval dominance of the Mediterranean. In these battles the *Littorio*, *Vittorio Alfieri*, *Maestrale*, *Vincenzo Gioberti*, *Giovanni Delle Bande Nere*, *Zara*, *Pola* and *Fiume* were either sunk or smashed beyond immediate repair.

In the Cape Mataplan show torpedo bombers from H.M.S. *Formidable* so damaged the vessels of the trapped Italian fleet that it was a simple matter for the surface craft to come up and deliver the *coup de grace*. A short time later, officials of the British Fleet Air Arm announced that during the first two

years of war, torpedo-bombers and other bomb-carrying aircraft had sunk or seriously damaged forty enemy warships. In addition they had sunk 440,000 tons of enemy shipping and had accounted for 230 enemy aircraft.

Have we forgotten, too, that the *Bismarck*



Thar she blows! An air-borne torpedo hits toward the water after being launched.

The newest type of aerial torpedo is shown in the photo below, as it is being wheeled toward a Beaufort plane in England.





Douglas "Devastator" bombers fly in formation on patrol over the California coast. This is the American Navy's version of the hard-hitting torpedo plane.

was stopped and set up for a killing by Fleet Air Arm bombers?

For many of us, this war began on December 7, 1941, when Japanese planes practically cleaned out American naval strength at Pearl Harbor. We know that the *Arizona* an old but modernized battleship was sunk. The *Oklahoma* was not sunk, but she *capsized!* Three destroyers went to the bottom and a modernized target ship, the *Utah* went down. The rest of the casualty list included the loss of 91 officers and 2,638 enlisted men. Within a few hours a Japanese battleship of the *Kongo* class was sent to the bottom by bombs discharged from a Boeing B-17. On December 10, the *Prince of Wales* and the *Repulse* were sent to the bottom.

Those who still stuck out for the battleship sought vainly for excuses. One high ranking naval expert in New York, pointed out that the *Prince of Wales* and the *Repulse* were

afforded no air fighter screen, and that had they been given suitable air protection both might have been saved. He pointed out that at least thirty Japanese torpedo bombers had delivered that many torpedoes and that nineteen had found their marks. His claim was that had they been harried by British air fighters, the Jap bombers would probably have been driven off, or at worst prevented from accurate attacks.

It is true that there were no defense fighters over the two costly British battleships—until it was too late. But it must be pointed out that in the Cape Matapan show, British torpedo bombers scored equally as well when they had to face the onslaughts of Italian cruiser-catapulted aircraft and defense fighters that were able to take off from nearby land bases!

The writer appreciates that he is taking a long chance in penning an article of this kind. Under the circumstances, it might be considered material not particularly conducive to national morale and national safety. It is the writer's sole intention to present the actual

facts and allow the reader to draw his own conclusions.

In the past, I have advocated a greater Air Force, the widespread adoption of civilian pilot training and the opening of pilot ranks to those who have not had a complete college training. I have plugged the sergeant-pilot idea for years. I have pumped hard for the greater appreciation of the flying club and Air Cadet training in public schools. Until December 10, 1941, I did not believe the military airplane would completely dominate the surface battle fleet. I have long been a great admirer of the Navy and all its glorious traditions; its discipline and tactical efficiency. I am not an ex-Navy man, but an ex-R.A.F. pilot.

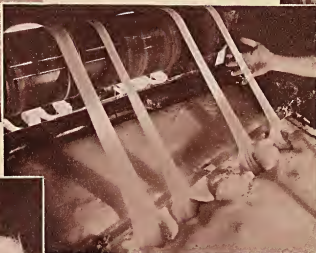
Today, I honestly believe the torpedo-aircraft will so overshadow the modern battleship, that to continue to build them and train men and officers to man them, will be

[Continued on page 162]

GOWNS BY BOSSY



Casein, from skim milk, is forced through fine holes of this spinneret into a chemical solution that "fixes" it in a skein of fine thread.



The "skeins" of milk threads are picked out of the chemical solution and run through rollers to dry, as pictured above.



And here (above) is your glass of milk! The casein comes out a fluffy mass of fine fibre that can be cut into any desired length. The dress in the picture at the right is all of milk.

YOUR next suit of clothes may be made from a glass of milk!

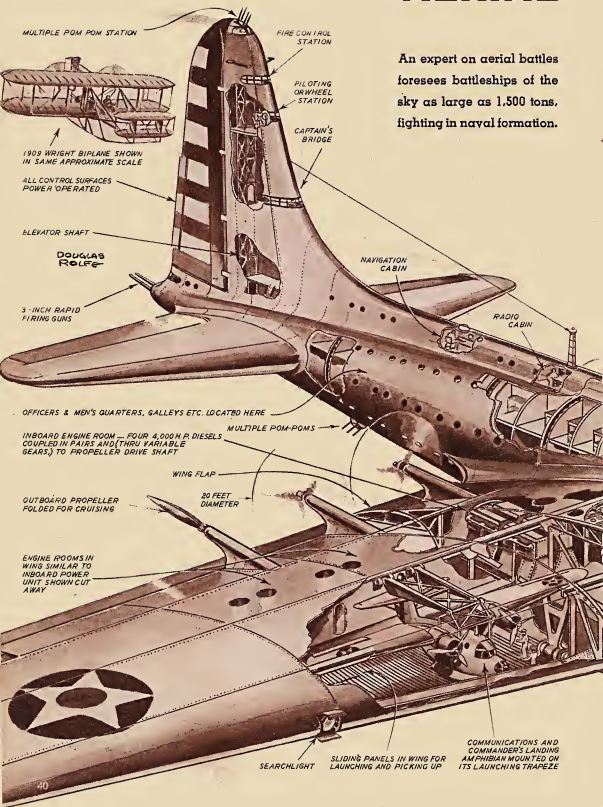
After four years of experimentation, the National Dairy Products Corporation announced recently that it had succeeded in processing a new textile fibre made entirely from cow's milk. The fibre has been accepted by the textile industry and already is being used commercially. It is more expensive than rayon and cotton, but less costly than fur and wool.

Billions of pounds of skim milk—left over after butterfat has been extracted—go to waste annually. The new process, in the future, will provide a market for at least part of this wasted milk, as the fibre is made wholly from casein, found in skim milk.

March, 1942



AERIAL



NAVIES OF THE FUTURE

by Lieut. Douglas Rolfe (Hon.), Royal Air Force

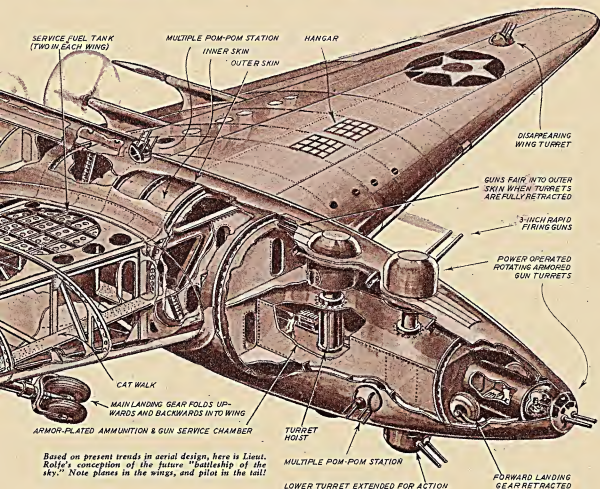
Illustrations by the author

The following article was written approximately two weeks before the surprise Japanese attack on Pearl Harbor. We believe the resemblance of the essential strategy described here to that of the attack on Pearl Harbor is remarkable, and is strong evidence that the author's reasoning throughout the article is sound. The cutaway drawing of an aerial battleship of the future on this page deliberately stresses present day trends in design, and avoids imaginative thinking as much as possible.

HIGH above the travelled air lanes the aerial armada sweeps on. Already thousands of miles from its home base and now rapidly approaching the main objective it flies at extreme altitude in order to fulfill one of

the fundamentals of war so tellingly brought home in the last great conflict of 1939-43, the element of complete surprise.

Flanked by heavily gunned lightly armored "cruisairs" and screened by incredibly swift



Based on present trends in aerial design, here is Lieut. Rolfe's conception of the future "battleship of the sky." Note planes in the wings, and pilot in the tail!



8000 H.P.

"destroyairs" hundreds of huge bombers, veritable battlewagons of the air, spread their wings in ordered ranks across the thin upper blue as far as human eye can see.

Accompanying this formidable array of fighting aircraft are troop transports, each with its complement of six hundred fully equipped armed men; carriers, literally bulging with amphibian gliders and "fifth-column commercial planes"; supply and repair planes carrying fuel, stores, spares and the necessary machinery for servicing and effecting minor repairs; hospital planes and still more transports carrying munitions, guns and mechanized equipment



1,500 H.P.



800 H.P.

1919 - TYPICAL BOMBER OF THE EARLY TWENTIES WAS THIS 4-PLACE MARTIN BIPLANE. WING SPREAD WAS 71 FEET AND THE MAXIMUM SPEED ABOUT 110 MPH.



400 H.P.

1910 - THE WRIGHT MODEL "B" WHICH FORMED THE NUCLEUS OF UNCLE SAM'S AIR CORPS HAD 42 A TOP SPEED OF 40 M.P.H., WEIGHED ABOUT 800 LBS.

1917-18 - DESIGNED IN EUROPE BUT PRODUCED IN THIS COUNTRY THE D.H.4 WAS USED ON EARLY AIR MAIL ROUTES.

1942 - WEIGHING 82 TONS AND SPANNING MORE THAN 200 FEET THE DOUGLAS B-19 IS THE WORLD'S MOST POWERFUL WARPLANE AND AN INDICATION OF THINGS TO COME



4,000 H.P.

1937 - THE ORIGINAL "FLYING FORTRESS" BOEING'S GREAT YB-17 BOMBER SPANNED 105 FEET, WEIGHED 16 TONS, AND MADE OVER 200 MILES AN HOUR WITH FULL WAR LOAD



1935 - THIS LATER MARTIN BOMBER STRUCK AN ENTIRELY NEW NOTE IN BIG BOMBER DESIGN - WITH A 71 FOOT WING SPAN IT WEIGHED 7 TONS



Airplane power and tonnage have increased by leaps and bounds in the past five years, as Lieut. Rolfe strikingly shows in the accurate, scaled drawings on these pages. The present war is unlikely to do more than "step up" our present-day serial designs.

sufficient to develop and exploit a concentrated attack from the air.

For this is no ordinary formation of bombers and protective fighters such as we are familiar with today. It is a completely equipped and self-contained expedition on its way to launch an utterly unexpected and paralyzing attack upon a far-off nation even now blissfully imagining itself at peace with the world and secure in its isolation and the not inconsiderable defensive air power it boasts.

Now they are but a few hundred miles from the shores of the doomed country.

From the flagship, where the commanding air marshal and his staff are gathered in the operations control cabin, a silent signal flashes

forth and immediately the entire fleet swings into a continuous circling movement at reduced speed while from the carrier ships drop innocent looking commercial planes cunningly faked to pass as friendly craft from bordering nations.

They drop rapidly and disappear in the direction of the objective.

All will land shortly thereafter at widely scattered airports in the country scheduled for invasion. Some will remain to spread a net of spies and saboteurs but others will depart in apparent normal air line routine only to return to the mother ship and report what they have gleaned. Another signal flashes through the fleet—battle stations are manned. Ugly looking cannon now peer through the hitherto sleek skins of the battle planes and



Effective bombing range of planes of various types is dramatically shown in above map.

the fleet deploys for the calculated lightning attacks about to be delivered in perfect synchronization at previously selected key centers.

The pattern of each attack is similar. The bombers move in to drop their deadly loads—two hundred tons at a time from each ship; the cruisers use their long range cannon to effectively prevent the approach of defense fighters and to silence the flak and other defense batteries below, and the destroyers range everywhere—dive bombing, strafing and disrupting nerve centers of the belated defense action and covering the landing of the air borne troops which follow. The amphibian gliders land in clusters everywhere to immediately shed their wings and become, on land, light combat cars, on sea, deadly mosquito craft.

As confusion spreads the heavy mechanized equipment is landed to back up and develop the initial attack until all resistance has been smashed. Striking at dawn all these operations are carried out in broad daylight and such is the force and suddenness of the attack that it accomplishes its whole purpose before

night falls. The commanding air marshal, who has been directing operations from his flagship high above the struggle, now descends to take over control of the conquered country. The entire invasion has been completed without the use of a single surface craft other than those brought by air with the invading fleet!

A fantastic picture? No! Probable? Yes, unless human nature undergoes a drastic change within the next few decades. There is certainly nothing in recent history to suggest such a change and the effective outlawing of war while, on the other hand, everything now transpiring indicates the increasing employment of much larger and much deadlier aircraft in waging war.

How about size then?

The smallest of the ships depicted in the alarming picture just drawn, the destroyers, are visualized as being of about 150 to 200 tons apiece while the heavy bombers, the real flying battleships, the supply ships and carriers would range from 600 to 1,500 tons gross weight! Is this stretching things too far—can such mammoth ships actually be built? Not at once perhaps, nor for several decades, but certainly within the lifetime of most people today.

The largest bomber produced today, the Douglas B-19, has a gross weight of 82 tons. At least one reliable engineer has laid down the general requirements for a 168 ton plane, powered with engines totalling 28,000 horsepower and carrying a useful load of 84 tons. Even larger ships have been suggested and as engineers with a national reputation to think of do not ordinarily indulge their pipe dreams in public print it may be assumed that planes will get bigger and bigger as the demand arises.

The famous designer, Igor Sikorsky, stated in an interview which was published in the October, 1936, issue of this magazine that: "he had at the moment complete plans be-



The largest flying boat ever built, the Martin "air battleship" of 70 tons, will transport 150 fully equipped troops.

fore him for a 50 ton plane; that in his opinion 50 ton planes would be in regular transoceanic service within three or four years; that 500 ton planes might be expected within two decades and that 'there seems to be no practical limit in sight for the size of a sea-plane!'"

This prediction was made five years ago. Since then planes have been in regular transoceanic service and the tonnage has been stepped up to over 80 tons. In view of these facts we may safely skip the technical aspects of size and take the engineers at their word that airplanes are going to get bigger and bigger.

What about range? At the outset of this article it was assumed that airplanes could and would operate thousands of miles away from their bases as freely as do naval fleets today. Is this assumption warranted? Yes, it would seem so. Apart from the developments to be expected in improved power plants and fuel consumption in relation to horsepower the fact remains that some of the larger bombers now under construction could, if necessary, fly to Europe and back without refueling.

A few years ago one of the surest ways to commit suicide in a blaze of publicity was to attempt a transoceanic flight.

Today, the Clippers arrive and depart with clock-like regularity while streams of

American built bombers drone daily across the Atlantic for service in the R.A.F.

Tomorrow, planes will undoubtedly operate with the same freedom as do surface vessels today, merely putting into far-off ports to take on fuel, and refit.

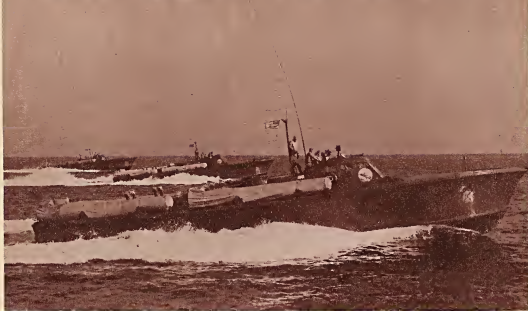
Are there any other reasons for supposing that aerial navies of the type envisioned will come into being and perhaps entirely displace sea power as we know it today? In order to answer this question and to estimate properly the growing importance of the plane as a war weapon in its own right let's glance over its startling development from a flimsy practically useless side line in army and navy equipment to the position it holds today when even sea power is endangered by the deadly dive-bombers and the equally deadly torpedo planes.

Less than thirty years ago, in 1912 to be exact, crude experiments in aerial bombing were made both here and abroad, as well as were the first attempts to mount machine guns.

In the same year airplanes had their baptism of fire when a few were employed in the current Balkan wars as reconnaissance machines. With a maximum and a minimum flying speed coinciding somewhere below the forty-five mile an hour mark, they were probably a greater source of

[Continued on page 157]

AT SEA IN A PT



With motors throttled down to a mere 40 m.p.h., and the crew muffled for winter's chilly blasts, the three PT's above go through maneuvers off the New Jersey coast. Lt. Comm. Earl S. Caldwell, left, in charge of the squadron, picks out his target and radios orders to other boats. Note the mosquito insignia on the cabin's side!

ON THESE pages, and on the cover, are the first photos to be released by the Navy of life at sea aboard a modern motor torpedo boat. Each of these rugged little craft has a top speed of 72 m.p.h., is 77 feet long, carries 4 torpedoes and a crew of 1 officer and 8 men. They can stay at sea from 4 to 5 days and worry enemy shipping to death with their speed, shallow draft and hitting power. Perfect physical fitness is required of the crew, and there is a waiting list for berths. (Note: Plans for building a model of the PT will be found on page 112).

Life on America's speedy little mosquito boats, as shown in these photos especially released by the Navy!



With perfect precision, the squadron, above, wheels into line in response to directions signalled from the commander's boat at right, below (signal flags are used when it is desired to keep the radio silent). With less leg-room than a submarine, the chart room, below, barely accommodates Commander Caldwell and his chief navigation officer, as they plot their position.



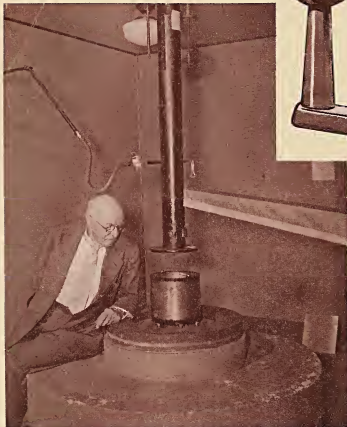


A glance at the spray from a PT's wake, above, and the hooded appearance of the sailor, right, will give you an idea of the speed with which these little boats whistle into the wind. And the combination galley, mess-room, radio shack and crew's quarters, below, is almost too compact for the Filipino mess boy to get about. The meal he's serving, incidentally, is not the average; when the boats are at sea, sandwiches are about the only edible food the rough going will permit, even if they're out for days.



Mother Earth Is Getting Plump!

by S. R. Winters



The strange looking instrument shown at the left is the "scales" on which scientists actually weigh Mother Earth. Dr. Paul R. Heyl is examining the machine.

MOTHER EARTH is putting on extra weight—approximately 125,000 tons every year. Really, though, Mrs. Earth needn't get too worried about it—not when you consider her actual weight to begin with. Roughly, she weighs 6,000,000,000,000,000,000,000 tons.

Since the beginning of earthy time, she has gained about 250,000,000,000,000 tons, according to geophysicists of the National Research Council of Washington, D. C., and of Harvard. These scientists have been engaged over a period of ten years weighing the earth.

It may sound like an impossibility to weigh the earth. Actually, though, the geophysicists have worked out two systems of putting the earth on the scales. The first involves obser-

vations of shooting stars. For the earth's extra poundage is being added in the form of so-called shooting stars which are showering from the skies constantly.

Over a period of years, the scientists have learned that the weight of a shooting star can be accurately judged by observing its brilliancy and speed. They have worked out an exact formula, based on data collected by many observers.

The second system involves a mysterious machine at the National Research Council which accurately calculates the earth's gravitational pull. Three factors are necessary for arriving at the total weight: 1. A formula known as the Newtonian constant of gravitation; 2. The earth's diameter, and, 3. The force of gravity at the earth's surface.

Knowing the Newtonian constant and obtaining the diameter from U. S. surveyors, the scientists have only to measure the variations in the earth's gravitational pull to complete their formula. This is done by means of the weird-looking machine pictured on this page.

The "earth-scale" consists of two attracting steel cylinders, each 1 foot, 8 inches long

[Continued on page 156]



Not a "palmist," but a miracle-working scientist is Dr. Robert Heger, shown above in his life work of examining human hands.

Your Life Is In Your Hands!

This amazing scientist can reconstruct a complete and accurate picture of you from only a single fingerprint.

by J. Warren Martin

DR. ROBERT HEGER examined a print of a right index finger. Then he called the staff artist of the St. Paul police department. Dr. Heger began to describe a face.

Slowly the artist drew features to fit Dr. Heger's description. Dr. Heger continued to study the simple finger print. From time to time he indicated slight changes in the

drawing. When the rough portrait was finished, he laid it on the police chief's desk.

"The man who left that print looks like this," he said.

Several weeks later a man was identified by the drawing and brought to headquarters. A print was taken from his right index finger and compared with that which Dr. Heger had



Given only this fingerprint, Dr. Heger built up this picture of this man. →

examined. They were identical.

The impossible had been done. A man's face had been reconstructed from a single finger print.

It looks like black magic—but in reality it was cold science.

For twenty-five years Dr. Heger, who has worked with the St. Paul police department, has studied human hands. Starting with conventional finger print identifications, he proceeded to analyze prints of entire hands. Using police records, he compared endless thousands of prints with the faces of the men and women whose hands they represented. Gradually he worked out a connection between finger and hand prints and faces.

He brought medicine to bear on the problem and found that the basis of facial characteristics usually lies in the glandular balance of the individual. This same glandular balance has much control over the shape of the hands.

Going deeper still, he discovered that there is a definite connection between a person's finger prints—especially the print of the right index finger—and structure of his body. It was through this last discovery that he was able to develop the system by which a criminal's face may be reconstructed from a single print.

The result has been a new and revolutionary weapon against crime. A criminal who has never been finger printed can no longer consider himself safe. A man's finger print has become a drawing of his face.



Then from the artist's drawing above, St. Paul, Minn., police arrested the man pictured below. Note the striking similarity between the drawing and the photos.



Heger has, however, gone even farther. He has succeeded in reconstructing a man's entire body from a finger or hand print. He has correctly indicated a man's height, build, weight, the color of his skin.

In one test he was given hand prints from six men picked at random from a group of fifteen. Heger had never seen any of the men involved. After analyzing the hand prints, he wrote detailed descriptions of the men from whom the prints were taken.

The nationally known advertising firm where the test was conducted then called in an outsider who had never seen either Heger or the men whose prints had been taken. He was given the descriptions and asked to pick out the men. In every case Heger's descriptions were so clear that identification was simple.



Dr. Heger believes hand analysis can be made an effective method of crime prevention. He has worked out a new means of hand-printing shown in these photos.

On another occasion a newspaper which was about to run a feature on Heger's work decided to conduct its own test. A camera man photographed the hands of a member of the staff whom Heger had never seen. The picture was rushed through the darkroom and Heger was shown the wet print.

Studying the picture, Dr. Heger described the man exactly, even making the true statement that he had a habit of dropping his chin on his chest and looking over the top of his glasses. Heger declared that the glasses were indicated by the fact that the man belonged to a type which often has weak eyes.

But the discovery of this astounding new method of identification, which is now being utilized by numerous police departments, is but one of the many which have resulted from Dr. Heger's lifetime study of hands. Other of his discoveries have developed new methods of preventing crime.

Science knows that certain types of glandular abnormalities tend to produce criminal personalities. Such glandular abnormals may have ungovernable tempers, be diabolically cunning, or be prone to perpetrate unsocial acts.

There are three main glandular types, the



Inking the palm with white, instead of black ink, Dr. Heger takes the impression on black paper, as shown in pictures above and right.



pituitary, thyroid, and adrenal. The ideal man is a mixture of the three. If a man is mildly slanted toward any one type, no harm will generally occur. But if he is definitely out of balance toward a certain type, a criminal personality may be produced.

Dr. Heger's researches have revealed that a man's hands will show his glandular type. For instance, a short fingered hand generally denotes a man of the thyroid type.

Moreover, children's hands also reveal glandular balance. Therefore, if the hands of juvenile delinquents are examined, it is possible to spot any glandular abnormalities. Corrective measures can then be used so that the physical basis for criminal tendencies is overcome. This system of crime prevention has already been put to good use in many sections of the country.

Dr. Heger has spent a dozen years building up a file of hand-prints and has become particularly interested in the relationship between the prints of children and juvenile delinquency. He has collected thousands of prints of juveniles guilty of crimes of larceny, sex crimes, crimes of violence, etc., and has classified all of them according to crime groups. He finds a marked similarity of hands in each crime group, indicating that like glandular disturbances tend to produce like crimes.

His greatest hope is that his researches along this line may enable authorities, by means of such analyses, to anticipate criminal tendencies in children and correct them.

Dr. Heger's greatest problem is trying to explain that he is not a palmist. His work is based on scientific principles developed by medicine and finger print analysis. Palmistry is an ancient superstition based on the fallacy that a man's future can be read in his hands.

Incidentally, Heger spent a number of years exposing palmists in cooperation with Harry Houdini, greatest of stage magicians.

Heger declares:

"The palmist makes untruthful statements about what is going to happen to a man. The scientifically trained hand analyst makes true statements about what may happen to a man if he doesn't do something about it. After



Studying this photograph of the hand of a man whom he had never seen, Dr. Heger described the man so accurately that a policeman, using the description, was able to pick the man from a group of a dozen. From the hand only, Dr. Heger told the man's weight, height, hair and eyes and skin colors.

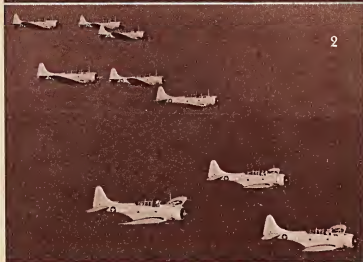
all, a man makes his own fate. All the hand analyst can do is to tell him what physical and glandular problems a person of his type will have to face."

Heger has perfected a special method for taking hand prints. Prints are usually taken with black ink. Heger uses white ink and black paper. The ink is spread on the palm with a special soft rubber roller. Next the hand is pressed on the paper and outlined with a white pencil. The result is a perfect imprint of even the most minute details. Such imprints can be more readily analyzed, Dr. Heger finds.

In considering the scientific study of hands, it is interesting to remember that it was our hands which made us human. Science believes that in the dim past of this planet our species became masters of the earth because we had the hands best adapted to utilizing primitive tools. Man's brain was built by his hands.

And now man is using his brain to analyze his hands.

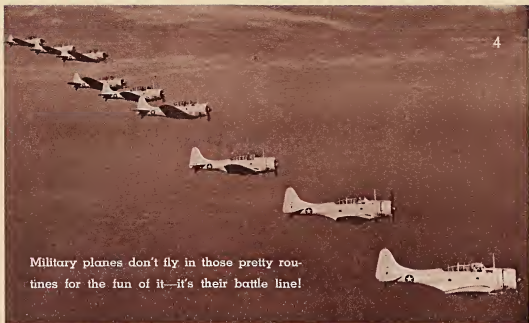
WHY FLY IN FORMATION?



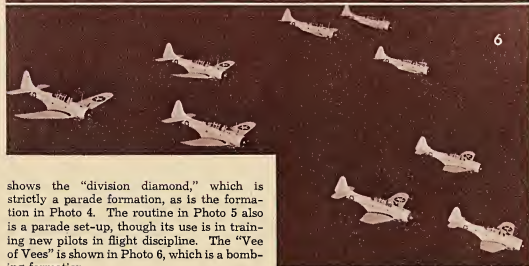
ALL military pilots are required to conduct different types of routine formation flying. For the pilot's own protection against an enemy, the more compact a formation, the more defensive weapons may be presented; and the surest tip-off that a man is poor flying material is his inability to maintain formation.

The six formations shown here by U. S. Navy fliers are all, in a sense, peacetime maneuvers, since to show wartime routines would be releasing vital information to the enemy. Photo 1, for example, is the "Big Vee," in which individual planes guard only in one direction and the outside man takes care of himself. This formation, with the planes farther apart, is used in scouting. In Photo 2 the planes are divided in left echelon preparatory to breaking off to land one by one. Photo 3

Mechanix Illustrated



Military planes don't fly in those pretty routines for the fun of it—it's their battle line!



shows the "division diamond," which is strictly a parade formation, as is the formation in Photo 5. The routine in Photo 5 also is a parade set-up, though its use is in training new pilots in flight discipline. The "Vee of Vees" is shown in Photo 6, which is a bombing formation.

Never-Miss



Frank Khristiansen, above, sights his deck gun on the big hump-back shown at right—and another batch of whale oil heads for our thirsty war machinery!



by Andrew R. Boone

DRIPPING gray fog shrouded the Pacific as the *Gleaner* rolled easily through mild swells. "Visibility 100 feet," sang the lookout from the crow's nest, 50 feet up the main mast. The engine of the little converted tug throbbed steadily. On the deck, a mantle of gloom settled, wraith-like, hiding the stem from those huddled in the stern.

"No bonus today," grumbled one of the crew, a newcomer who knew little of the great ocean and its vagaries. The prospect of losing the extra \$4.50, paid all deck hands when a whale succumbs to the harpoon, was not pleasing. Nor did I relish the idea of spending a day bobbing for humpbacks and sul-

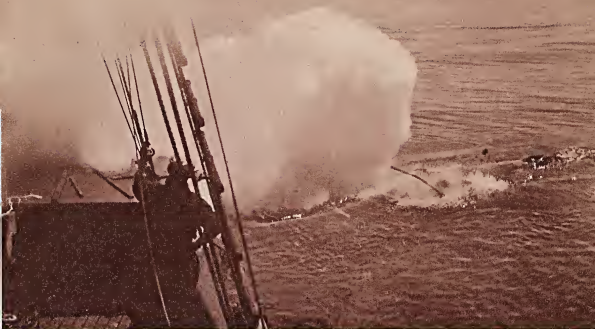
phurbottoms, only to go ashore at dusk without incident or picture to embellish this tale of the last whaler.

You see, whaling has virtually disappeared from the world scene. War has driven most of the Norwegian, German and British killer ships from the sea. Despite the war, the Japanese continue their operations unmolested. (Reports from the Antarctic indicate they are slaughtering large numbers of the mammoths). As for continental United States, a single whaling station produces valuable whale oil, the most perfect lubricant known, and one which is vital to the stepped-up U. S. war machine.

It was from this station, lying hard by the water in Humboldt Bay, at the tiny community

Kris!

Frank Christiansen, "Last Of The Whalers,"
is still in there shooting for Uncle Sam.



A hit! The harpoon slashes into the big whale's side—but the battle's far from over! This lad still has plenty of fight.

of Field's Landing, California, that the *Gleaner* put out at dawn, wallowing through rough seas until the fog rolled in to smooth the turbulent surface. Now the thick soup threatened to rob the crew of their extra pay and the station of a day's catch. Unless you can see 'em, you can't catch 'em. That's axiomatic.

For a full half-hour, the *Gleaner* proceeded through the heavy blanket of moisture. Then, shortly after eleven, tossed aside by a warm westerly wind, the fog lifted, disappearing nowhere into the blue. Almost at that instant a voice bellowed down from the crow's nest:

"Off the starboard bow . . . four humpbacks."

Gunner, skipper and crew looked eagerly across the sea.

"Two hundred yards," the lookout boomed, his voice flattening out in the distance. "Two cows and two bulls."

Cautiously as a setter stalking quail, the



Shrouding himself in spume, another big bull breaks the surface right under our prow!

March, 1942



Gleaner moved up. Gunner Frank Khristiansen, who has spent thirty-odd years re-enacting just such scenes in all the oceans where whales are found, walked quickly to the whaling platform in the bow. Now he took command, for only the man at the trigger of the stubby gun can know exactly where the ship must be placed to get in a killing shot. Skipper Eugen Lund stood ready to execute the orders from Kris.



"Never-Miss Kris," is the way this sharpshooter is known to the whaling fraternity. The fact is, unless he sets the first harpoon in, he'll probably lose his quarry.

Once the projectile strikes, the whale is doomed. Seldom does even a hundred-tonner escape, and seldom does one break a line. As for the harpoon, whose steel leg is divided in the middle like an elongated eye—it is tied to the heavy hawser by 15 turns of Swedish steel fence wire. Three hundred feet of line are coiled in the pan near the gun, and this in turn is spliced to a longer sea rope leading to the winch.



But, now, peering intently ahead, Khristiansen began calling signals. "Slow ahead." We dropped speed perceptibly. "Two points to starboard." We swung toward the larger pair of humpbacks. Two city

Our newest prize attempts to make a break for it, top, but Gunner Khristiansen takes aim and slams two quick shots into the big mammal's side, center. The whale puts up a terrific struggle, almost bashing in the side of the boat, but he's soon riding peacefully in tow, as seen from the crow's nest, at left.

Mechanix Illustrated



And here's our catch at the processing station. A workman testifies to Kris's accuracy by pointing to the harpoon gash.

blocks beyond the gunner I could make out both of them. One . . . "that's the cow," Lund explained . . . was blowing, rounding and diving just ahead of the bull.

Every time the cow surfaced, the *Gleaner* worked in closer to the next expected point of emergence of the bull, for the ship was following almost in a direct line behind the cow.

Not a word was spoken now, as we moved ahead slowly. With uncanny precision we came closer and closer to the big fellow. Ten minutes fled with the breeze.

The giant pair, unaware a killer followed their trail, progressed through the calm sea with the nonchalance of two lovers out for a Sunday stroll.

As they blew, mist escaping from their lungs like steam from a boiler, less than one-thirtieth of their bulk showed on the surface. Following the blow, each inhaled with an odd whistle, humped its back like a porpoise and, with a rounding action, disappeared in what looked for all the world like a vertical dive. Their giant flukes, or double tail, seemed to wave a thumb-on-nose farewell.

"Sometimes," Capt. Lund remarked, "we follow all day. I hope . . ."

Action in the bow cut him short. Thirty feet off the starboard bow the bull's back broke water. Khristiansen crouched intently behind the gun, his practiced eye sighting along the muzzle. His right hand tensed. Wham! The 135-pound harpoon leaped from

the muzzle-loader, flashed in a straight line through the air, and disappeared in the giant body. Four pounds of black powder in the war head exploded, accompanied instantly by a roaring snort of fright. The humpback seemed to rise vertically, as though propelled upward by a submarine explosion, and without delay plunged in another vertical dive. Blood covered the surface in a rapidly widening circle.

"Fine shot," a deckhand shouted. The harpoons had entered immediately ahead of the tail. "Bonus for this," jubilantly cried another. Four bucks and a half for the crew, twenty-five for the skipper and gunner. Nice

[Continued on page 153]

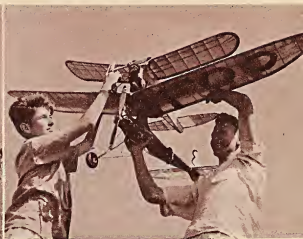


Meanwhile, a sailor gets the harpoons, or "war heads," ready for another hunt. Each contains 4 pounds of blasting powder.

Models Try New Tricks



The "pilot" of this model actually bails out! The chute is shown packed in the photo below, left, and releasing itself, above.



An amazingly ingenious "pick-a-back" combination that really works is shown in the photo at right, above, the planes detaching and continuing in flight after they have taken off. Below, another pick-a-back combination, with five workable models.



MODERN aviation may be moving ahead rapidly in its race to keep ahead of the dictators, but it isn't showing any more progress than the model-builders! As fast as new full-size planes appear, the model fans are right behind them.

As an example of the ingenuity of the model-makers, take a glance at the jobs pictured on this page. Note the pick-a-back in the photo at the right, above; this one really works, with the smaller plane taking off in mid-air from the wing of its brother! Another pick-a-back, with four small craft on its wing, is at the left, while a paratroop plane is shown in the top photo.



For Your Safety - -

KNOW YOUR BOMBS!

Learn now what damage the various types of bombs can do to you—it will be too late when the enemy eggs start falling!

FOR almost a decade, America has read about, discussed, looked at newsreels and made sacrifices to aid cities throughout the world which have been ravaged by bombs. Until the last few weeks, however, the thought that such a winged affliction ever could come to our cities was something we dismissed as war propaganda. Now we recognize the bomb threat to the United States as a grim and shocking reality.

How will our cities stand up under the relentless pounding of an air raid? How safe are the buildings in which we live, work and play? What kind of bombs are being tagged for our consumption, and what is the extent of the damage each can do?

These questions are answered in detail in a pamphlet, "The Schools and Civilian Defense," issued recently by the New York City

Board of Education. Since the information in the pamphlet is pertinent to all buildings, everywhere, we print excerpts from it so that our readers may have this vital information at hand.—THE EDITOR.

I. Kind of Bombs in Use Today.

DEMOLITION BOMBS are designed for the primary purpose of demolishing buildings and other structures. They range in weight from 50 to 4,000 pounds, about half the weight being the explosive. In the attacks on European cities, the majority of bombs dropped have not exceeded 550 pounds in weight. Large bombs intended for factories or railroad yards may land in a residential district, even when civilian bombing is not intended.



One of the heaviest of all bombs is shown above. It is a 2,000-pound, armor-piercing egg as used in raids by the R.A.F.



The girls above are capping fragmentation bombs, the type which are light and effective mainly against exposed civilians.



FRAGMENTATION BOMBS, which weigh from seventeen to thirty pounds, are effective chiefly against personnel. They can be used against targets which are easily damaged or destroyed by fragments, although demolition bombs are generally used for these purposes.

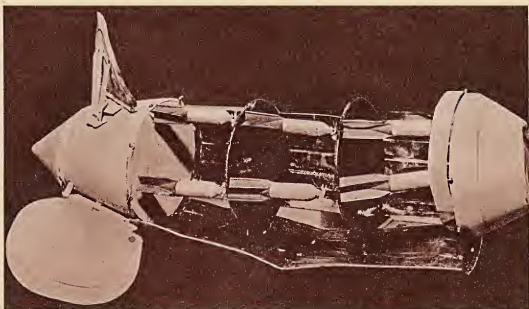
GAS BOMBS are usually much smaller than demolition bombs and their effects on structure are much less. In general the gases from these bombs are heavier than air and would make basements particularly dangerous. The lower the story the greater the danger from gas.

INCENDIARY BOMBS, usually weighing from two to 100 pounds are composed principally of magnesium, thermite, oil, or other highly incendiary material, and are used chiefly against easily inflammable targets. Some phosphorus bombs have been developed and used in certain instances.

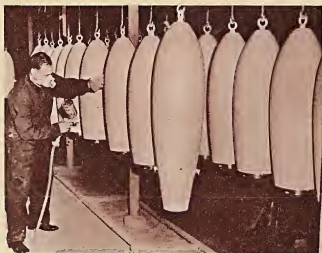
AERIAL MINES are very large bombs weighing approximately 2,000 pounds, similar in design to submarine mines. They are released with a parachute and detonate on impact or later, producing an intense blast effect. They may be used against miscellaneous targets, including densely built up residential areas.

(**AERIAL GUNFIRE** against ground

No, not a bomb—but an incendiary foil. When exposed to sun, after being dropped, it will ignite in a short time.



Modern war's most interesting new bomb development—the "Molotov Breadbasket," which is a container filled with numerous small incendiaries for scattering from a plane. Russia's invaders will vouch for this one!



Demolition bombs, at left, do just what their name implies—break havoc on densely populated sectors. Above, Sgt. Frank Newton, U. S. Army, with his new, high-power aerial bomb.

structures is of relatively little importance in comparison with the danger of bombs to structures.)

FRAGMENTS FROM DEFENDING ANTI-AIRCRAFT SHELLS, which fall from considerable heights, attain velocities sufficient to cause injuries to unprotected personnel and to such portions of buildings as light tile roofs, skylights, windows, etc. This is one reason why school children should be off the streets in the event of an attack.

The immediate effects of an aerial bomb upon striking a target are impact and de-

tonation. Impact may result in penetration, and detonation may result in blast (known as shock in earth or other solid media or simply blast in air) and fragmentation of the bomb case. . . . Apart from damage from impact and fire, the effects of high explosive bombs are due to three factors—blast, fragments and shock.

2. How Far Will a Bomb Penetrate?

The amount of penetration depends on many factors such as the size of the bomb,



Representative Bloom, of New York, is shown above with an incendiary bomb of the type the Nazis dropped in England.

properties of materials struck, etc. For example: A 500-pound, delayed-action bomb will have a crater twelve to twenty-three feet deep in earth, sand and gravel, and a penetration of approximately 2.6 feet in reinforced concrete where the slab is continuously supported. A 2,000-pound bomb would have a penetration of thirty to fifty-seven feet in earth, sand and gravel, and a crater depth of 5.8 in reinforced concrete where the slab is continuously supported. Even though a concrete slab may not be penetrated there is a tendency to fling off from the rear of the target a piece opposite the part struck. This is known as "scabbing."

In multi-story buildings the bomb is apt to explode either in the top story or to penetrate two or three floors, exploding between them. Cases have occurred where six or more floors have been penetrated by a bomb with a long-delay fuse.

3. Effects of Dropped Bombs.

BLAST. By blast is meant the compression and suction wave which is set up by the detonation of high explosive. At every point in the neighborhood of an explosion there occurs first a momentary wave of high pressure (for about .005 seconds for a 500-pound demolition bomb), and then a negative "suction" pressure. The pressure which the moving gas exerts on an object is the summation of the static pressure and pressure caused by its velocity. The wave of pressure is highest in the region of the explosion and falls off rapidly the further it moves away. Everything in the immediate neighborhood of a big bomb, therefore, will be exposed suddenly to a violent pressure wave of many times atmospheric pressure whereas, depending on the bomb, everything fifty feet away may be exposed only to two or three times atmospheric pressure. Thus all things in the immediate neighborhood of an

[Continued on page 167]



A one-ton time bomb is dug out of the earth somewhere in England. Unexploded when it hits, it goes off sometime later.

RUN 'EM WITH STEAM!

You aren't a real model railroader until you've built one that steams!



The unbelievably accurate detail of one of Mr. Shattock's models is shown in the photo at right.



Victor T. Shattock of Oakland, Calif., is generally credited with being the top "live steam" model builder of America. He is shown in the picture at left. Above is one of his realistic models running.



by Harry De Lascaux

THERE can be no question that live steam railroading represents the highest accomplishment in model railroading. Certainly it is the most difficult, requires the greatest craftsmanship, and takes more understanding of the actual function of the steam locomotive than any other phase of the model railroading art.

Out in Oakland, California, one of the country's most enthusiastic, and certainly one of the most devoted live steamers is Victor T. Shattock. He's been a live steam fan for 20 years, has built half a dozen beauties of his own, and helped fellow members of the Golden Gate Live Steamers build a couple of dozen others. He's been on Dave Elman's Hobby Lobby program, and has made contacts from one end of the country to the other.

So, when we listen to Vic Shattock tell us a few things about live steam railroading, we can be sure we're getting the real lowdown.

"In the first place," says Vic, "I believe the 2½ gauge is the best practical size. If you try to build a real live steam loco in the HO, or even O gauge for that matter, you'll run into nothing but watchmaking. Parts are too small to do anything with. It's awfully hard making good injector valves and steam transmission lines from the tender, and more important still, you just can't get enough steam in your boiler to run the train more than a few feet. So I've found that the 2½ gauge,

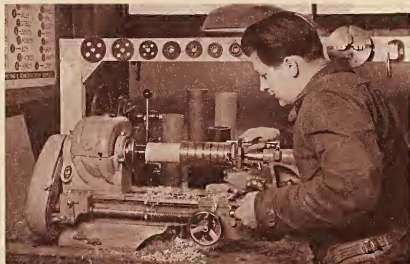
[Continued on page 160]

YOU CAN WIN



FIRST PRIZE

\$1,700 AERONCA Defender
Trainer. 2-place, 65 h.p. cabin plane!
250-mile cruising range, latest 1942
model! The chance of a lifetime!



THIRD PRIZE

\$240 ATLAS lathe.
Last word in shop
equipment! Re-
versible automatic
power, 16 spindle
speeds, wide range!

THESE SWELL PRIZES!

A \$1,700 Aeronca Defender Trainer, \$466 Crosley sedan, \$240 Atlas lathe, and thousands of dollars in other prizes—ABSOLUTELY FREE TO MI fans!

HERE'S the second call, men! You still have a chance to enter the great **SECOND ANNUAL MECHANIX ILLUSTRATED PRIZE CONTEST!**

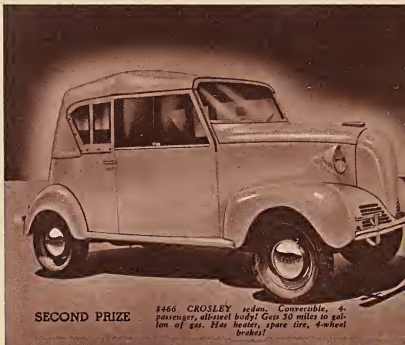
Just take a look at some of the prizes on these and the next ten pages. Pretty swell, eh? And you can win any one of them, too—just by playing a game! It's amazingly easy, which you'll see just by looking at the "Words Within Words" games on Pages 76 and 77.

Maybe you've always wanted your own plane. If so, that Aeronca Defender Trainer is your prize. It's worth \$1,700, has a 250-mile cruising range, seats two, takes 40 pounds of baggage and boasts a 65 h.p. motor! You can win it—and for FREE!

Or maybe you need a new car. In these days of riding economy, you couldn't do better than that Crosley sedan. It's a convertible, 4-passenger, all-metal job, with a heater and air-cooled engine. The Atlas lathe is worth \$140 and comes complete with \$100 worth of accessories—an ideal addition to your workshop. And no movie fan will deny the value of that Revere Turret Model camera and projector, for use with either black-and-white film or Kodachrome. Or maybe you go for that Elgin wrist watch. It's the Lord Elgin model, valued at \$110, and it'll last a lifetime!

But—just turn the pages, and pick your prize!

March, 1942

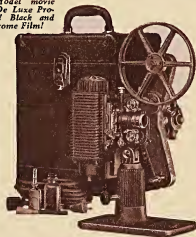


SECOND PRIZE

\$466 CROSLLEY sedan. Convertible, 4-passenger, all-steel body! Gets 30 miles to gallon of gas. Has heater, spare tire, 4-wheel brakes!

FOURTH PRIZE

REVERE Turret Model movie camera and Revere De Luxe Projector! Value \$167! Black and white, and Kodachrome Film!



FIFTH PRIZE

\$110 LORD ELGIN Wrist Watch! 21-jewel movement! Elgin guarantee! Stunning terraced design!



DETAILS ON PAGE 76



6th PRIZE

WALKER-TURNER \$99.50 Variable Speed Lathe! Rugged, safe! Drive speed 260 to 4,200 r.p.m.!



7th PRIZE

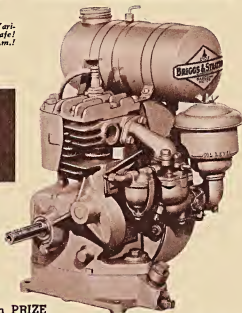
FLYTIMER All-Purpose Watch! Value \$82.50! Water-proof, shock-proof, dust-proof! 17-jewels!

Free Prizes!



9th PRIZE

HALLIGRAFTERS
Marine Radio! Value \$74.50! Skyliner Marine Model. AC/DC on 110/125 volts!



8th PRIZE

\$75 BRIGGS & STRATTON boat engine. Air-cooled, 4-cycle, fits almost any boat! Includes oil bath, air cleaner, gas filter, high-tension magneto and muffler.



10th PRIZE

SEA PAL \$68.75 Radio Direction Finder! Complete with batteries, headphones, charts. Dynamic speaker, long- or short-wave!



11th PRIZE

UNDERWOOD Typewriter Champion Portable! Standard keyboard, rugged construction! Used by writers, journalists, business executives!

Mechanix Illustrated



12th PRIZE

HAMILTON Elton \$60.50 Watch! 17-jewel, 10-size movement! 14-K gold-filled! The watch of railroad accuracy!



13th PRIZE

\$60 H & H RESEARCH CO. filing and honing tool! Senior Model, reciprocating action! Does filing, honing, polishing, snagging, etc.!



14th PRIZE WHIZZER \$59.95 Bicycle Motor! Weighs 28 lbs., fits any bike! 120 miles to gal., does 25-30 m.p.h. Easily installed, permits pedalling.



15th PRIZE

\$50 ZEPHYRPLANE, JR., Belt Sander! Lightweight, Skilsaw product. Produces ripple-free finish in a jiffy!



16th PRIZE Choice: Portable **GUILD CUTTER** or **GUILD SANDER!** \$48.50 Value! Both are ideal for homecraftsmen! Rugged, sturdy construction!



17th PRIZE

TEACH-A-PHONE course U.S. School of Music! 96 lessons! Value \$45! Famous Print and Picture method, 16 records, all instruments!



18th PRIZE

EDDIE BAUER Pure Down, blizzard-proof sleeping robe! Value \$40! Mfg. by Ed Bauer, Seattle.

19th PRIZE

HERKIMER O. K. TWIN Model Engine! Costs \$40! For use on all models!



March, 1942

DETAILS ON PAGE 76



20th PRIZE

\$35.15 DELTA 24", 4-speed scroll saw! 4 blades! 4-speed cone pulley on arbor! Timken crankshaft! Shaft-driven blower pump!



22nd PRIZE

\$30 MOTOROLA Wireless Automatic Record Changer! Takes 8- and 12-inch records on any radio!

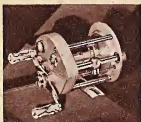
23rd PRIZE

\$25.90 FEDERAL Enlarger! Has f/6.3 Anastigmat lens! Vibration-proof, modern, foolproof!



25th PRIZE

MOSSBERG "Targo" Sheet Set! Value \$25.50! Has gun, ammunition, targets, net!



28th PRIZE

\$25 PFLUEGER "Supreme" Satin Nickalum fishing reel! Lightweight!

29th PRIZE

\$25 WINNER Water Skis! Water-proof! Rubber foot harness!



21st PRIZE

\$35 LIONEL locomotive! Inside and outside 3rd rail collectors! Scale model couplers on pilot and tender. Approved by NMR!



24th PRIZE

SPARTON MUSIC-AIRE Horn! Value \$25.60! Choice of 4 models! Complete with assembly parts!

26th PRIZE

WESTON \$25.50 Exposure Meter! For still, movie cameras! For dim, bright light! Ultra-sensitive, Weston "Master" model!



27th PRIZE

\$25 BLUE STAR Lathe! Greater capacity, new refinements, heavier design! 4 speeds, ball bearings!





30th PRIZE

\$25 Ultra De Luxe "HANDIE" Workshop Tool! 27 accessories! For grinding, polishing, cutting!

31st PRIZE

DYNAMIC \$24.75 Super-Charged Welder! High-grade transformer type! High Heat Output!



32nd PRIZE

ARGUS A3 \$23.85 Color Camera! Streamlined, f/4 Anastigmat lens, 18-36 exp./ 35mm. film!

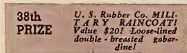


35th PRIZE

GENERAL ELECTRIC \$21 Triple-Whip Mixer! Three-beater! High-torque, permanently-oiled motor!

36th PRIZE

EDDIE BAUER \$20.50 Blizzard-Proof Down Jacket! Lightest, warmest on earth! Made by Eddie Bauer, Seattle.



38th PRIZE

U. S. Rubber Co. MILITARY RAINCOAT! Value \$20! Loose-lined double-breasted gabardine!



33rd PRIZE

BAUSCH and LOMB \$22.50 Microscope! 75/- 300 diam. magnifications! With all equipment!



39th PRIZE

\$20 STANLEY Tool Chest! Has hammer, screw driver, bits, chisels, auger, etc.! 17 tools!



34th PRIZE

CORSAIR II \$22 35mm. Camera! Built-in exp. meter. f/4.5 Anas. lens!



37th PRIZE

Flexible Flyer \$20 SPLIT-KEIN Skis! Designed in Norway by expert! Mfg. by S. L. Allen Co.



40th PRIZE

KALART \$20 Automatic Speed Flash! Mechanical, self-cocking, universal synchronizer! No winding! No cable!

DETAILS ON PAGE 76

More Prizes!



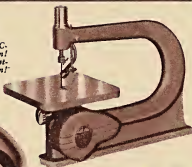
41st PRIZE

\$19 F. A. Smith **ARC-TIC-AIRE** Fan!
Streamlined, dust-proof, modern 12" fan!



44th PRIZE

DOOLING \$17
Model Racer! 12" long, does 70 m.p.h.
Approved by champions!



42nd PRIZE

\$17.75 **POWER KING**
15" Jig Saw! Handles light to 2" wood!
Sturdy, accurate!



43rd PRIZE

Wilson \$17 **DON BUDGE** Autograph Tennis Racket! Finest lamb gut! Strata-Bow frame!

45th PRIZE

SHEAFFER \$16.75
"Tuckaway" Pen and Pencil Ensemble! 1/10 14K gold-filled, lifetime guarantee!



46th PRIZE

\$16.50 **FEE & STEMWEDEL** 5-power Field Glasses! 40mm. Achromatic lens! Wide vision!



47th PRIZE

EDDIE BAUER \$16.50
Pure Down Quilted Blk-cord-proof Jacket! Light, warm, made by Eddie Bauer, Seattle!

48th PRIZE

\$15.75 **LOBAUGH**
Model C & NW Refrigerator Car! Exact scale! 12 1/2" long! Ready to run!



49th PRIZE

IVER JOHNSON \$15 Rifle!
Sling strap, Lyman sights, single shot! Bolt action! Self-cocking!



50th PRIZE

\$14.50 **RADI-ANT** 3-way Projection Screen!
For stills, movies! 30"x40"!



51st PRIZE

SHWAYDER BROS. \$13.50 Men's 2-Suit-Traveling Bag! Strong, roomy! Accommodates complete wardrobe!



52nd PRIZE

GILBERT \$13.50 Erector Set! Builds hundreds of thrilling marvels! Made by A. C. Gilbert!





53rd PRIZE

\$13 WILCOX, CRITTENDEN Marine Lamp! Reg. Marine Side Light! Polished Brass!



56th PRIZE

\$10.95 G-M Exposure Meter! F/1.4 to 32! Jeweled movement! Accurate!



59th PRIZE

KIRSTEN \$8.50 Radiator-type Pipe! Filters the smoke! Takes out bite!



62nd PRIZE

CRAFTY-AID \$7 Home Step Ladder! Chair, table, tray, ironing board combined!



55th PRIZE

\$12 ALASKA Sleeping Bag! Flannel-lined, storm-proof! Alaska Sleeping Bag Co., Portland, Ore.



54th PRIZE

\$12.50 JUNIOR Model Motor! Ready to run! Has spark plug, coil, condenser!



57th PRIZE

RONSON \$9 Table Lighter! Modern Danish design! Compact, ideal with silverware!

60th PRIZE

\$8.25 HODGMAN Parka! Vulcanized, rubberized! Zipper front, storm-proof!



58th PRIZE

\$8.50 WESBAR Car-Top Carrier! Heavy duty! For boats, canoes, skis, sleds! Fits all cars!

61st PRIZE

\$7.75 WEED Tire Chains! Non-kinking! Electric welded! Save your tires!



63rd PRIZE

\$6.75 COMET Sailplane Gas Model Kit! With retractable gear, prop saver, etc!

64th PRIZE

G. H. Q. Gas Model Motor! Not a kit! For planes, boats, cars! Ready to run!



DETAILS ON PAGE 76

More Prizes!



65th PRIZE

MILES KIM-BALL Personal-sized Golf Balls! Your name on 8 balls! Cost \$5.65!



66th, 67th & 68th PRIZES

3 **INGERSOLL** Sweep Second Wristwatches! Value \$5.50 each. Second hand sweeps whole dial. For nurses, athletes, etc.!



69th PRIZE \$5.50 **EVERHOT** Timer Clock! For turning fans, radios, heaters, on and off!



70th PRIZE

\$5 **CARROM** Game Board! Tournament size. Hardwood veneer. 57 different games!

71st PRIZE \$4.85 **DREMEL** Moto Saw! For high-speed cutting. Uses same current as 75 watt bulb!



72nd PRIZE

\$4.75 **TROJAN** Binoculars! Perfect optically! Complete with carrying case!



73rd PRIZE

DAISY \$4.50 Pump Repeater Air Rifle! 50-shot, take-down model. Adjustable sight!



76th PRIZE **HULL** \$3.25 Streamline Auto Compass! Fits any windshield, any car!

74th PRIZE

\$4.30 **BOYCE-MEIER** Sextant! The boatman's ideal! No more guessing!



75th PRIZE

\$3.35 **DELTA** Powerlite! Dry cell lamp! No wires or oil!



77th PRIZE

HULL Streamline Marine Compass! For all boats. Polished brass or chrome!



78th PRIZE

COMET "Interceptor" Gas Model! \$2.95 value. Simple construction, sturdy!



HERE ARE PUZZLES 1 & 2

CONTEST RULES

- [illegible]

Below is a reprint of Puzzle No. 1, which appeared in the February issue. Contestants may use this blank or a legible copy of it, as an official entry in the contest.

PAR FOR PUZZLE NO. 1 IS 275

CONTESTANTS!

Would you like to have a chance to win a cash prize, as well as one of the regular contest prizes, shown on the preceding pages? If you would, turn to page 150 and see how you can win a Cash Sponsorship prize, merely by telling your friends about MECHANIX ILLUSTRATED'S great "Words Within Words" contest!

PUZZLE NO. 1

P									TOTAL
H									
O									
T									
O									
G									
R									
A									
P									
H									
E									
R									
S									
TOTAL									

In The MI PRIZE CONTEST!

HOW TO DO "WORDS WITHIN WORDS"

Insert on each horizontal line a single word, of not more than eight letters, the first letter of which is already printed on that line. These letters, already on the puzzle and reading from top to bottom, comprise the KEYWORD. Each word you fill in on horizontal lines must consist of letters appearing in the KEYWORD. Any English word appearing in the Webster's New International Dictionary, Second Edition, may be used, provided no letter appears in your word more often than it appears in the KEYWORD. Example: If "T" appears in the "Keyword" three times, it may not be used more than three times in any one horizontal word. No word may be used more than once in the same diagram. Plurals are permissible.

Method of scoring: Each letter in the finished diagram counts one point the first time it is used, two points the second time it is used, three points the third time, etc. In filling spaces, place letters below and their point value above the curved line as shown in the Specimen Puzzle in the space below. Thus, above the first letter of the KEYWORD put the figure 1. Place 2 above the letter the next time it is used, 3 above it the third time, etc. Your completed diagram will show a score above each letter of each word. Then total all numbers appearing in each horizontal line. The total of these figures is your total for the puzzle.

A par, or average score, will be given with

PAR FOR THIS IS 210

SPECIMEN PUZZLE										TOTAL
M ₁	A ₁	I ₁	N ₁							4
A ₂	C ₁	T ₁	I ₂	G ₁						9
N ₃	U ₁	T ₂	N ₂							6
U ₂	R ₁	T ₃								7
F ₁	A ₃	I ₃	R ₂							9
A ₄	G ₂	A ₂	N ₃							20
C ₂	A ₄	R ₃	T ₄							14
T ₄	R ₄	I ₄	M ₂							15
U ₃	N ₄	I ₅	T ₅							20
R ₅	A ₅	I ₆	N ₄							26
I ₇	N ₅	N ₅								25
N ₆	U ₄	N ₆								25
G ₃	R ₆	I ₇	N ₇							30
TOTAL										210

each of the three contest puzzles. Do your best to beat par!

A careful study of the "Specimen Puzzle" appearing on the opposite page is recommended, as it illustrates the correct scoring procedure. You can do better than the specimen, however! That's just to give you an idea how it's done.

PAR FOR PUZZLE NO. 2 IS 280

PUZZLE NO. 2										TOTAL
I										
N										
V										
E										
N										
T										
I										
V										
E										
N										
E										
S										
S										
TOTAL										

NAME _____
 ADDRESS _____
 CITY _____ STATE _____
 If you were sponsored in this contest fill out the following.
 If not, leave these spaces blank.
 SPONSOR'S NAME _____
 ADDRESS _____
 CITY _____ STATE _____

Save this puzzle and Puzzle No. 1 until you have completed Puzzle No. 3 appearing in the April issue of MECHANIX ILLUSTRATED. Send all three completed puzzles in together.

You're RIGHT — That's WRONG

Here are 25 statements, some of them true, the others false. The trick is to separate the true statements from the false ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

- | | |
|---|---|
| 1. A flitter mouse is a bat, not a blue footed squirrel.
True <input type="checkbox"/> False <input type="checkbox"/> | 14. The queen bee might well be termed a high hat insect, as she seldom uses her sting except on another queen.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 2. Shrimps are not always as small as the ones you eat at dinner, for some kinds may weigh as much as three pounds.
True <input type="checkbox"/> False <input type="checkbox"/> | 15. No creature living in the world today weighs as much as the prehistoric dinosaurs.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 3. A hall-diver is not a stainless steel stuka, but a bird known as a dabchick.
True <input type="checkbox"/> False <input type="checkbox"/> | 16. If you're worried about your car remember that 43% of all the cars ever sold in the United States are still in operation.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 4. A rock pigeon is the same thing as a clay pigeon except that it is considerably harder.
True <input type="checkbox"/> False <input type="checkbox"/> | 17. The great toe on your foot has more bones than the little toes.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 5. Neon, the gas which produces the ruddy glow of so many modern advertising signs, was discovered in 1898.
True <input type="checkbox"/> False <input type="checkbox"/> | 18. Riboflavin was a famous French statesman who popularized the celluloid collar.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 6. A duck hunter who uses a setter as a hunting dog is called a setter.
True <input type="checkbox"/> False <input type="checkbox"/> | 19. Some bacteria that spoil meat can survive five hours of boiling.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 7. The helicopter is not the only type of aircraft that can rise vertically. The modern autogiro can too.
True <input type="checkbox"/> False <input type="checkbox"/> | 20. Many well known diseases are far more contagious than the common cold which so many people fear catching.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 8. Human beings are not the only ones who suck their thumbs in babyhood. Infant baboons are also thumb suckers.
True <input type="checkbox"/> False <input type="checkbox"/> | 21. Marlin, or spearfish, have been known to drive their swords as deep as six inches into wood.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 9. There are more people in the city of New York than there are hairs on your head.
True <input type="checkbox"/> False <input type="checkbox"/> | 22. All messages or documents to be carried by homing pigeons must be attached to the bird's legs.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 10. Although the wings of a modern airplane are built larger than the tail, it is the tail that carries most of the weight.
True <input type="checkbox"/> False <input type="checkbox"/> | 23. Whale milk is entirely different from cow's milk, and has an altogether different group of vitamins.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 11. Despite their drab appearance, fiddler crabs outdo the hen by laying eggs with purple yolks.
True <input type="checkbox"/> False <input type="checkbox"/> | 24. If you're fond of sea food you might have enjoyed the clams that lived a few million years ago, as their shells were 40 inches in diameter.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 12. There is no known way to tell a huckleberry from a blueberry.
True <input type="checkbox"/> False <input type="checkbox"/> | 25. There are only three electron microscopes in existence today.
True <input type="checkbox"/> False <input type="checkbox"/> |
| 13. Present day experimental plastic automobiles are much heavier than steel ones of comparable size.
True <input type="checkbox"/> False <input type="checkbox"/> | |

WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly, and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 162

NEWS OF SCIENCE AND MECHANICS

NEWEST 60-TON TANK
WARBIRDS WITH FLAP-
PING WINGS — MODEL
PLANE SETS RECORD



Transport "Floats" On Snow!

THE unusual vehicle shown above and at right is a new type Army transport invented for use at Alaskan bases. It pushes over snowdrifts on two torpedo-like cylinders equipped with cork-screw flanges. Revolving in opposite directions, these flanges provide tremendous pulling power. The cylinders pack the snow tightly and provide a roadbed on which trucks may drive.



Two-Way Bowling Alley For Home

THE newest in parlor games is this two-way bowling alley, shown at right. It has a shelf-like compartment hinged on each end of the alley into which the tenpins and balls fall. The compartment opens out, as shown, enabling the bowler to step close to the alley.





Holds Secret Of Cosmic Ray It Exposes Fake "Blondes"

THIS small "doughnut" is the most powerful ray producing machine ever invented by man. It is the heart of a new machine called the Rheotron, produced at the General Electric Research Laboratory. The Rheotron, with alternating electro-magnets, fires an electron some 200 miles in $2/1,000$ th of a second, creating artificial cosmic rays.

IF YOU suspect your girl friend's blond tresses of being phony, turn on the "Black Light" shown above, and it will tell all! Dyed hair gives off a sickly fluorescence under the light. Hair that is unhealthy due to some scalp disease shines a brilliant green. Natural blond hair glows violet. The light is being used to diagnose scalp ailments.



Goldfish Go To Work For The Telephone Company!

EVEN goldfish have been drafted now by U. S. Industry. The telephone company uses the tank shown at the left to test carbon filaments for use in telephone switchboards. For years, it has been necessary to change the tankful of chemical solution at least once a week, due to the fact that minute plants, known as algae, grew in the liquid and made it cloudy. Recently someone got the bright idea of putting goldfish in the tank, since goldfish eat algae. Three fish, Oscar, Reuben and Sadie, were drafted, and now the solution stays clean.

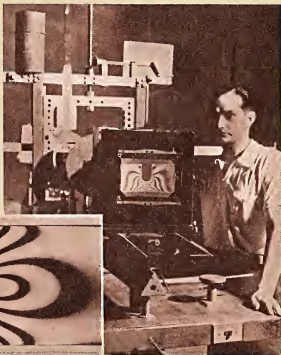


Put On Your Chains Without Leaving Car!

IF YOUR car is equipped with the ingenious new device shown above and left, you'll never have to climb out of the driver's seat into mud or snow in order to put on your chains. Touch a button and a clutch arrangement engages the chains.

Photographing Accidents Before They Can Happen!

HOW can you see an accident before it happens? The answer is photo-elasticity. If an engineer, for instance, wishes to know how an I-beam for a bridge is going to stand up under strain, he makes an exact replica of it in bakelite, then photographs it with polarized light. The photo shows exactly where stresses will occur. At right is the photo-elasticity machine. Below is a stress-photo of a bolt and nut under pressure.





The Typewriter Goes "Juke Box"

NOT satisfied with slot machines to feed you, shine your shoes, play you music, tell your fortune and relieve you of your bank roll, the slot machine moguls have now moved in on your letter writing. Mary Gallagher is shown at the left operating a new "juke box" typewriter installed in the lobby of the Piccadilly Hotel in New York. She drops a dime in the slot and can then use the typewriter for thirty minutes.



Blistered Hands Made An Inventor Out Of Her

MRS. MILDRED FOLTZ, farmer's wife living near Milwaukee, Wis., pares a lot of apples and peaches every year at canning time—and every year her paring knife blistered her hands. Mrs. Foltz finally got mad about it and invented a "blister-proof" paring knife. As shown in the small picture, it has a molded handle to fit the fingers snugly. Now Mrs. Foltz has a thriving business, manufacturing her patented knives at home.



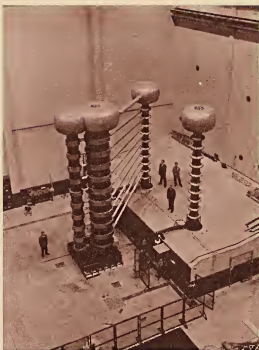
"Rat Trap" Catch Keeps Skis Firm

LIEUTENANT FINN ANDVIG, a member of the Royal Norwegian Air Force in Canada, is the inventor of a new device for locking on skis, which he is demonstrating in the photograph at the left. The catch operates like a rat trap, snapping on the toe firmly. It leaves the heel free for fast skiing and greater foot action. The catch also makes the process of putting on skis handier and more speedy. Lieutenant Andvig escaped from Norway and is now in Canada.



Cop Becomes Mechanized

THIS traffic patrolman at Salem, Mass., is a gadgeteer at heart, and he has fixed up his traffic control station to his heart's desire. It is equipped with a huge loudspeaker on top of the booth, through which he can bellow admonitions to traffic violators; with a rear view mirror, to enable him to watch both streams of traffic simultaneously; with a siren, and automatic lights.



World's Mightiest X-Ray

THIS titanic machine is the new 1,400,000-volt X-ray machine recently installed by General Electric in the U. S. Bureau of Standards at Washington. The 30-foot column in the foreground is a direct current generator. The columns in the rear house the X-ray tubes. The machine produces radiation equivalent to that of fourteen pounds of radium. It is used for government testing.

Model Plane Sets 75 M.P.H. Speed Record

BILL HOPPER of Indianapolis is shown in the photograph at the right proudly displaying his model plane, the "Tiger Shark," which recently set an unofficial world's speed record for model planes of 75 miles an hour in controlled flight. The official record is held by Don Hodgson of Long Beach, Calif., whose model hung up a clocked speed of 69.99 miles an hour in controlled flight. Bill will try for the official record soon.





Where Did I Put That Rule?

ADOLPH JACKSON of Los Angeles never has to stop a job to search for that misplaced rule. To take care of that workman's problem, Mr. Jackson has installed a three-foot flexible ruler in the handle of each of his tools. A hammer, a paper-hanger's knife, a lineman's knife, a tracer wheel and a paper cutter all are equipped with such rulers, as shown in the photograph above. Mr. Jackson's gadget costs about a dollar.



Chemistry In Miniature

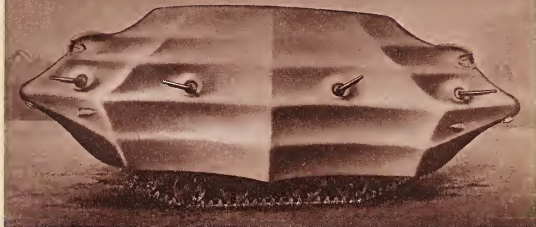
BECAUSE he must analyze specimens of microscopic size, Dr. E. Bruce Ashcraft of Westinghouse Research Laboratories designed the set of pigmy chemical tools shown in the picture above. He analyzes tiny specks of rust and tarnish, seeking to overcome the problems of corrosion on electrical contact points. When he discovers the element in the air causing corrosion, Dr. Ashcraft designs methods to combat the particular problem.



Teacher Faces Class With New Blackboard

THIS unique new classroom lecture desk mechanism permits the teacher to remain seated facing the class while she works demonstration problems, rather than having to go to the blackboard and turn her back to the class. Called a "Striptoscope," the device allows the teacher to write on a pad of cellophane on her desk. The writing is then projected on a large screen at the front of the desk. Inset shows the pad.

NEWS OF WAR AND DEFENSE



The Deadliest Tank On Earth?

SHROUDED in secrecy, this frog-like "two-headed" tank marks the first radical departure from conventional tank design since 1918. Cleveland W. Cole, Los Angeles inventor who designed the tank, claims that the slope of the tank's sides will deflect shells 180 feet away regardless of the angle from which they strike. Its eight main guns protrude

through "eyeball" sockets. If a gun is removed for repairs while in action, a cover snaps shut over the opening. Made of arc welded steel castings, the new tank could be made 50 per cent lighter than regular types, without losing any of its impregnability, according to Mr. Cole. A nitroglycerine ejector for the tank has also been designed.

60 Tons Of Fight For The U. S.

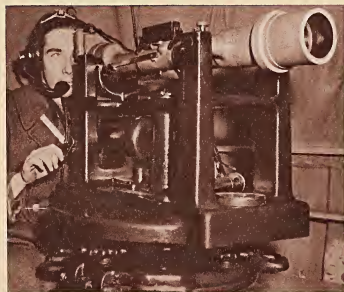
PERCHED serenely atop an M1. 60-ton tank, Captain A. J. Seiler pilots the first of the heaviest armored units for the U. S. Army. The fumes and smoke are emanating from a dummy jeep which the tank has just crushed like an egg, during a demonstration at the Baldwin Locomotive Works at Eddystone, Pennsylvania. Don't yawwalk in front of these fellows.





"Fastest, Farthest, Fiercest!"

DEVELOPED for the British Bomber Command, the newest type attack-bomber, the Vega Ventura, shown in these two pictures, has also been accepted by the American Air Force. A mystery ship, whose details of performance are closely guarded, the Vega is, however, known as the "fastest, fiercest and farthest-flying" warplane yet developed for "hit and run" attack. Military authorities say it flies faster than the Hudson (which hits off 284 m.p.h.) and has a longer range than the Hudson (1950 miles). Notice particularly its new type "paddleboard" props.



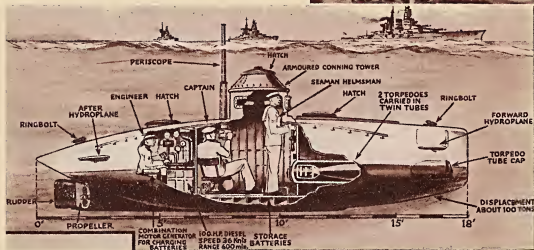
Seeing Eye For Enemy Aircraft

THIS photograph shows in clear detail the type of "roving telescope" put in use on the West Coast to scan the skies for enemy planes. The plane spotter is stationed in a concrete, bomb-proof dugout "somewhere near San Francisco," looking out to sea. By means of the crank in his right hand he keeps the telescope constantly moving from side to side, giving him clear vision to the horizon. The spotter is connected directly to air raid alarm headquarters and to a master plotting room.



Little Men—Little Machines!

THAT the Japanese smallness of stature is reflected in his wartime mechanical designs is strikingly demonstrated by the pictures on this page. The picture at right top shows a one-man tank developed by the Japs and used in the campaign in Malaya. It was the only tank of such diminutive size used by any army up to the time of that campaign. At top, left, is a picture of the Jap two-man "suicide" submarine washed up during the attack on Pearl Harbor. Note that it is different in design from the other two-man sub shown at right, and that both these subs differ substantially from the sketch of a three-man submarine below.





The Stuka—But Not Its Bomb—Crashes!

THE photographer caught one of the minor mechanical miracles of war in the picture at the left. A German Stuka dive bomber was shot down during the Lybian Campaign and crashed before the pilot had a chance to drop his bomb load. The Stuka landed still carrying 1,000 pounds of high explosive bombs under its wings—and the bombs remained unexploded, as can be seen in the photo. The crew, too, escaped without injury.



First Ack-Ack Guns Go Into Action Here

A BATTERY of Artillery Anti-Aircraft guns manned by the Washington National Guard is shown with the skyline of downtown Seattle as a background. With the sounding of first air raid alarms over the West Coast, this battery is believed to have been one of the first on the mainland of the United States to have gone officially on the alert for enemy planes. This is a mobile battery of the type which will be used in most coastal cities.



Flapping Wings On U. S. Warbirds

APPROVED by the U. S. Navy, this unusual photograph shows the radical new "Vindicator" warplanes now in use by the Navy. The aircraft have wings that fold upwards, yet open out for action in a few seconds' time. The device substantially increases the number of planes which may be accommodated aboard a carrier. This picture was taken aboard the U. S. S. Ranger, "somewhere at sea." Plane in the foreground is the "Wildcat."

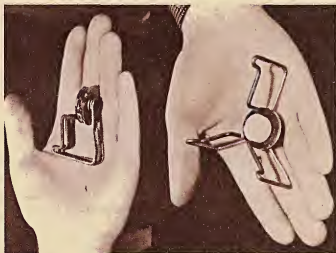
For Those "Bomby" Summer Evenings

WHEN summer heat comes around and the bombers come with it, it will be difficult to blackout your windows and still get a breath of fresh air—unless you own such a device as the one shown in the photograph at the right. It is a louvre which can be made to fit any window. It is completely light-proof, but the slots still permit air to enter freely. Shown in the picture is Melville Wolff, New York "blackout" authority.



The Kitchen Stove Fits In Vest Pocket

PARACHUTE troops of the U. S. Army have been heard to complain that they have to carry "everything but the kitchen stove" when they jump. Now they have to carry the stove, too! But it's a vest pocket stove, as can be seen in the picture at the right. It folds flat, as shown at left in photo, and fits in the palm of the hand when opened (right). It burns a chemical tablet to heat cans of emergency rations carried by 'chutists.



MI Office Gets Air Raid Cart

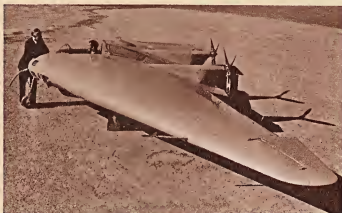
THIS emergency "air raid go-cart," recently installed in the New York office of MECHANIX ILLUSTRATED, is the latest thing in streamlined protection against fire and bomb damage. Miss Shirley Cutter of the MI staff is demonstrating the self-contained searchlight on the truck, which carries cable cutters, axe, tarpaulin, fire extinguishers, ropes, sand buckets, gas masks and every other imaginable device to combat catastrophe.





Flea Fleet Vows Swift Defense Via Water

THE Navy's famed mosquito boats inspired Miami owners of fast outboard motor boats to form a fast-attacking "flea fleet" which can reach any point in their area in a few minutes, with hand grenades, rifles, pistols, dynamiting equipment, two-way radio, and Red Cross unit. Said to go into action faster than any known attack group, fleet strength includes three planes, smoke-screen-laying boat, water-skiing riflemen.



Altered Flying Wing Makes Test Flights

EFFECTIVENESS of several noticeable changes—mainly elimination of the cathedral-angle wing tips—was determined in new test flights of the sensational "flying wing" at Lancaster, Calif. Military secrecy surrounds application of the development to production models. The new models are being tested under Army supervision.



Special 'Chute Equips Paratroops' Mascot

WITH 15 hours' flying time credited to her, Trixie, bonafide female private in the 16th observation squadron at Ft. Benning, is receiving ground instruction to prepare her for leaps from planes with her parachuting pals. Here learning what happens after a leap when the 'chute remains open and "in the wind," paralog Trixie's next lessons will be a jump from a 250-ft. parachute tower, just like any human novice in the observation squadron, prior to practice leaps from a plane.

Column of Amphibious Tanks Attacks Island

PREVIOUSLY pictured only singly, the Army's formidable new weapon, the alligator tank, which is equally powerful on dry or swampy terrain, is here shown organized into a column for a surprise practice attack on an island of man-groves near their Dunedin, Fla., training base. The amphibians enter shallow water and deep mud with all the aplomb of the scaly monsters after which they're named.



Marines Use New Portable Ack-Ack

THE features of the machine-gun have been adapted to today's all-important defense against airplane attack, in this portable anti-aircraft gun. It can be set up quickly in a position from which it is judged it will be most damaging to flying attackers and moved without delay to a more advantageous location.



Slanted Mirror Aids Fuse Case Grinder

THE perfect symmetry necessary in fuse cases can be obtained in grinding only if the operator has a vertical view of the work. Placing a slanted round mirror directly in front of the girl operator's eyes provides the needed vertical view. Watching the cutting process this way while working requires exceptional coordination of eyes and hands. Heavy gloves are protection against cuts.

The mirror comes in handy for applying lipstick and powder, too—if the boss isn't watching!





Tears The Air Apart

THIS giant air raid siren, with its rapidly revolving slotted drum, literally tears the air apart, producing a shriek heard for miles. They are being installed all over the country. This siren, driven by a powerful electric motor, has an audible range of from two to six miles, depending on atmospheric conditions. They are being produced in large numbers.



Lamps For The Night Patrols

ARMY planes now patrol the West coast air at all times to forestall a possible surprise attack. Landing light batteries of 1,000,000 candlepower are set up on the backs of trucks and used to illuminate the landing fields for planes coming in from the night patrols. Lenses must naturally be kept clean and polished at all times.

Bombs Were Not All That Fell

JAPANESE flyers, in raiding Pearl Harbor on December 7, carried more than bombs, for propaganda leaflets and supplies of concentrated food were found in downed enemy planes. Picture at right shows a few of the items discovered, which include a bottle of "Rare Old Island Whisky," cider pop, calorific candy, whisky-soaked chocolate paste, hardtack, tooth powder and the inevitable chopsticks.



CRAFTS AND HOBBIES

PHOTOGRAPHY
MODELS • RADIO
HOW - TO - BUILD
THE WORKSHOP

SPOT-FLASH DRAMA



An ordinary, medium base flash lamp is mounted in the spotlight housing, as above, to produce dramatic, directional lighting of the moving subject, shown at left ($1/8$, $1/500$ th). Ordinary synchronized flash tends to light everything (below) even though it stops the action. An ordinary spotlight hasn't enough power to permit a rapid, stop-action exposure like this.

by Roy Lester

HAVE you ever tried to get a dramatic spot-lighted action shot, indoors? It's not as easy as it seems.

If you use a strong spotlight, you'll get the black background and sharp-cutting, directional lighting you want. But your shutter speed will have to be relatively slow and it will be almost impossible to stop the motion of a subject like the one illustrated.

Should you use high-speed, synchronized flash to stop the action, the flash would light the surrounding walls, losing the dramatic effect desired. This is bound to happen even when a midget flash in a special "directed-light" reflector is used on an extension, off

[Continued on page 152]



"Matched" Picture Titles



by Kenneth Murray

Above: All of the titles in this photograph album were clipped from newspapers. Not a single entry seems inappropriate.

YOU can give your personal photograph album unusual appeal by attaching clipped titles underneath each picture. No special skill is needed for devising clever, laugh-provoking titles because the method is almost automatic. This particular version originated with Harry Blackstone, the magician, who has prepared dozens of albums with titled pictures of his travels.

Use the following method. Instead of trying to think of suitable titles for each picture, build a title collection without consideration of pictures with which each might be used. Secure several old newspapers or magazines and scan the news headlines as well as the

[Continued on page 156]



Above: Here's a sample of the phrases and colorful and descriptive words that can be clipped from a single issue of a small newspaper. Left: Transparent Scotch tape makes a neat cover for album titles. The glossy finish is attractive.

PHOTO CONTEST

FIRST PRIZE (\$10.00): "Dance Recital" by Robert A. Howard, 1138 Upland Street, Chester, Pa. Taken with a Kodak Junior Six-20 on Super XX film, in D-76, f/11 at 1/50th second, by light of 2, No. 2 and 1, No. 1 floods.

SECOND PRIZE (\$5.00): "Visions" by Paul Hadley, Piggott, Ark. This composite was assembled from a print of the water, another of the man and tree, and a third in which the girl's head was double printed on a cloud; it was all rephotographed on process film, after assembly. **THIRD PRIZE (\$4.00):** "Hiernation" by James W. Porth, 2732 North Downer Avenue, Milwaukee, Wis. **FOURTH PRIZE (\$3.00):** by Albert Schwab, 5231 Gainor Road, Philadelphia, Pa. Taken with a 2 1/4 x 3 1/4 Speed Graphic on Superpan Press film; No. 0 Superflash synchronized at 20 feet, f/4.5 at 1/400th second. The subject: Temple University vs. Rhode Island at the Philadelphia Convention Hall.

Submit prints for the monthly **MECHANIX ILLUSTRATED** contest unmounted—no larger than 8x10 inches. With each print, list your camera, film, lens opening and shutter speed, illumination, and developer. Write your full **NAME** and **ADDRESS** on the back of each print and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, you must enclose return postage. (Published prints cannot be returned.) Address: Photography Editor, **MECHANIX ILLUSTRATED**, 1501 Broadway, New York, N. Y.



1st PRIZE



4th PRIZE



2nd PRIZE



3rd PRIZE

Angle Your Models



The startling effect illustrated above is achieved by the simple set-up shown below. The background must be plain, above all, and the light arrangement must be carefully planned.



Clever arrangement of your models can portray "impossible" feats of prowess.

by Louis Hochman

ONE of the prime requisites of a good composition is that it be taken from an interesting angle. The odder the angle, the more powerful the composition usually is. With this fact realized, amateurs and professionals, alike, have been crawling low on the ground or climbing high in the air in search of new and unusual angles from which to take their pictures. The camera, to date, has probably been used from every conceivable angle—all for the sake of a new viewpoint.

Shooting from odd camera angles is a good idea, but why stop there? There are other good and unusual effects you can get with odd angles without having to climb a tree or hop into a ditch. Instead of shooting from an odd viewpoint, why not pose the model in an odd angle, simulating some action which, due to the restrictions of gravity, could not normally be posed? The pose should be consistent with the model's physical capabilities, but in printing, the composition can be cropped and turned around to show the model in an action pose, normally impossible to hold.

Take the photograph, "Descending From Space," for example where the idea of a pair of shapely, feminine legs descending into an outstretched hand is portrayed. Normally, this position would be extremely difficult, if not impossible, to hold even with professional acrobats as models. It was a simple matter to pose this subject upside-down as the explanatory illustration beside it shows—with the model pointing her feet into the air instead. In this position, the muscles of the legs fall backward, preventing a knotty appearance, thereby adding grace and shapeliness. The resulting picture shows the desired effect when cropped properly, and turned upside-down.

Of course, when taking a picture with the intention of turning the print around, care should be taken not to have a background that would give the trick away. A simple background of neutral tone would be more suitable. The black background, used in most



"Descending From Space"

of the accompanying illustrations, was selected to simulate a black sky and thus help carry the illusion.

Long hair can be made to do funny things by posing your models at odd angles and letting gravity have its way. Hair flowing straight up into the air in direct contradiction to the laws of gravity, "Flaming-Haired Goddess," can be accomplished with the aid of gravity itself! All you have to do is pose your model upside-down, so that her hair will fall straight downward, and shoot a portrait of her in this position; then crop the finished picture and turn it upside-down for viewing. This effect can also be produced by having the model lie on a black drape, stretched out on the floor, as in the adjacent explanatory shot.

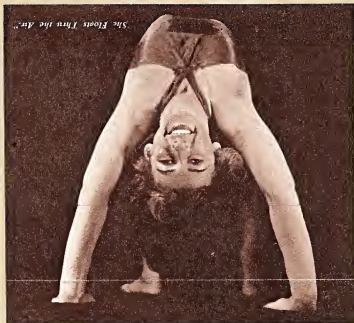
Simple stunts, like the back-bend, when printed upside-down will produce an entirely different and un-



The apparent acrobatic feat at the left enlists gravity as an aid. The model is merely posed upside-down as shown above and the leg muscles are smooth and supple instead of knotty.

usual effect like "She Floats Through the Air." In fact, most poses can be printed upside-down to produce these startling effects. Just

[Continued on page 152]



The pose above is easy to shoot. Note the unusual effect of turning it upside-down and blocking off the area between the white line and the photograph's margin.



Above: Before—the popular type of combination sunshade and filter holder used for the adaptation described here.
Below: After—complete Tri-Filter unit with filter folded.

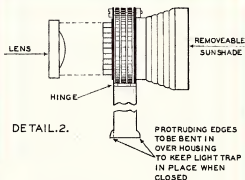


Tri-Filter

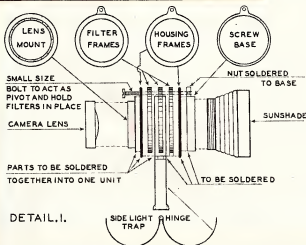
THIS self-contained sunshade and filter unit can be made to fit a lens of any size and to take any number of filters. In use, the undesired filters are swung away and the light-trap snapped tight to keep stray light out of the filter chamber.

Construction details are illustrated in the set of drawings at the bottom of this page. The filter frames can be made of aluminum, plastic, or even hard rubber from a discarded tray. Use a good household cement to secure the filters in place. Make the ends (frames) of the filter housing of hard brass or some other easily-soldered material. The light trap, half of which is soldered to the housing and the other half hinged to swing in a 180-degree arc, is made of spring brass; a lady's compact hinge will serve the purpose.

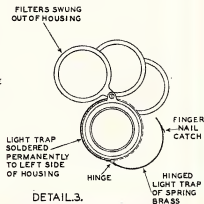
The filters and housing frames are drilled to take a bolt on which the filters pivot. The



DETAIL.2.



DETAIL.1.



DETAIL.3.

All construction features are outlined in detail in these three drawings. Dimensions will vary with the equipment used.

Sunshade Unit

by
Fred S. Jurkowski



Above: How the filters are moved in and out of the housing. Note the hinged light-trap, opening to the right. It closes securely whether a filter has been pivoted into position, or not. Right: The Tri-Filter Unit in use. Note that the unused filters are well out of the way of the camera's view finder.



bolt screws into a nut soldered to the top of the original sunshade filter holder being adapted for this unit. After $\frac{1}{16}$ inch of the screw base of the latter has been cut off, its two parts are soldered to either end of the filter housing.

The unit can be finished in chrome or with flat black paint or enamel, or black crackle.

Enlarging Lens Adapter

It is often difficult to fit an enlarger with a lens that was not particularly designed for it. This trouble can be avoided by means of the method outlined here if the enlarger has a tubular hood around the lens plate, as does the Leitz miniature enlarger illustrated at the right. A wooden adapter ring is employed. Turn a hardwood ring (on a wood lathe) to fit snugly within the tubular enlarger hood. The central opening of the ring should taper away from the lens; blacken it with ink or non-reflecting paint. Make a $\frac{1}{4}$ -inch wide shallow groove around the outer circumference and into it glue a strip of felt or cork (if the latter, roughen with abrasive paper) to hold the ring in the hood by friction. Run three 8-32 bolts through the ring as diagrammed below so the cork or felt gasket can be pushed out in three places to stop any play that develops. Leave the gasket unglued for a distance of $\frac{1}{8}$ inch from each bolt, and space the bolts 120 degrees apart. To minimize shrinkage and expansion, lacquer the wood well or saturate it with hot paraffin. Mount the lens flange to the outer face of the wooden adapter as shown. Never remove the fitting by pulling at the lens barrel; always unscrew the lens first and then grasp the wooden ring through the opening. —Walter E. Burton.

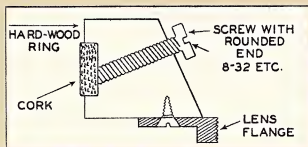


Photo Darkroom Shortcuts



Above: Cut film sheets and film pack may be washed in a pan without being scratched if the pan is adapted by the method illustrated. The bolts are placed near the top rim of the pan; the one shown is 5-inches deep and has a diameter of 15½ inches—permitting 10 sheets of 4x5 film to be hung on clips. Water is circulated by a hose pipe.—J. L. Braswell.



Above: A baby's play pen may be adapted for drying matte, and other non-glossy prints. Cheesecloth is stretched across the top of the frame, and the prints are placed face-down on the cheesecloth after excess water has been sponged off. Any other fine net material permitting circulation of the air on both sides of the prints will also do.—Louis Hochman.



Above: A piece of tissue paper or paper toweling, or blotting paper, can be pulled across the top surface of hypo solution to remove any scum that forms on the latter.—Wm. Swallow.



Above: Ferrotypes can be applied to ferrotypes tins, evenly and economically, by means of a pump-type sprayer such as the stores supply with window-cleaning fluid. Work the sprayer gently covering the surface with a fine mist; then rub down the surface with soft cloth.—Kenneth Murray.

Left: When developing cut film or film pack sheets in special rollfilm tank reels, the latter can be kept from rolling off out of reach, after each sheet is inserted, by placing it in a developing tray or small box cover.—Burt Knutson.



Useful to amateur photographers, this homemade fixing and washing tank is waterproof and unaffected by chemicals. Trays can be made of the same material. In order to cut paper into even strips, fasten a guide board to bed of trimmer.

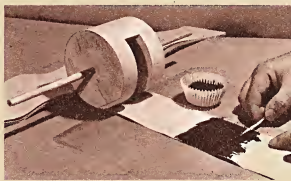
New Plastic For Workshop Projects

by Ken Murray

MERELY by adding plain water to a clean white powder you can make a liquid plastic which may be cast in a mold as easily as plaster of Paris. It "sets" within several hours into a hard plastic with a glossy finish that is unaffected by water, ordinary chemicals or solvents. It may be colored in any hue, including the familiar mottle of modern plastics, and it also may be extended or used as a binder with other materials such as wheat flour, wood flour or ordinary paper.

New uses for modern plastics are discovered daily, and even automobile bodies that are stronger than steel are now being made of the material. When purchased for use in the home shop, however, it must be cut, not shaped or molded, to the form desired.

March, 1942



Above: Two thick wood disks mounted on a dowel rod serve as a form on which the plastic-coated strips of paper are wound. Wood forms of any size or shape can easily be made for other projects. Below: Bottom of tank consists of cardboard disks which are held in place and coated plastic.





Left: This plastic-covered vase has an unusual, artistic appearance. The "skin" can be tinted to any desired shade.

Right: The bottom of the cheap glass vase, which serves as a form, is covered with crepe paper soaked in plastic.



Below: More treated paper is added to the sides of the vase and topped gently with a stiff brush to produce wrinkles.



Ornamental hanging flower basket. It is made of paper rope which has been coated with liquid plastic to make it strong and waterproof. Rope is shaped by winding it around a tin funnel of suitable size and holding the end with a spring clothespin until plastic is thoroughly dry.

There is considerable difficulty in cementing parts together so that they will hold well. None of this trouble is encountered in using the water-mixed plastic. It opens up an entirely new field, with innumerable possibilities, to the home workshop fan.

Marketed under the name of "Cascamite Plastic Adhesive" and sold by hardware stores and building supply dealers, the material was originally intended as a waterproof plastic glue. A pound costs 85c but it may also be obtained in 10c cans. A similar product is sold under one or two other trade names but as it has a distinct color it is less suitable.

The method of converting the plastic adhesive into a liquid plastic is simple. Use two measures of the white powder to one measure of cold water. Place one-half of the water in a glass or waxed-paper cup, or similar container, then add the powder and stir rapidly until it is smooth. This requires but a minute or so. Add the remainder of the water, stir again and the plastic is ready



Amateur printers will appreciate the simplicity with which cuts may be made from matrices. Mat is well coated with vaseline, after which plastic is spread on with knife or brush. Wood block is placed over plastic and held with weight until the plastic has set.



for use. For some purposes the powder may be extended with a filler such as ordinary wheat flour (not self-rising flour). This allows greater bulk while adding practically nothing to the cost. The mix requires 2 measures of the Cascamite powder, 1 measure of ordinary flour and $1\frac{1}{2}$ measures of cold water. Make up as described above, adding the flour and remainder of the water last.

The plain plastic liquid will set within 3 or 4 hours in a room temperature of 70 deg. F. The extended plastic requires from 5 to 7 hours for setting under the same conditions. In a warmer atmosphere both will set much faster.

A crack filler for use in repairing furniture, which has a minimum shrinkage and is not affected by thinners and solvents used in painting, lacquering or varnishing, can be made with:

- 2 measures of plastic adhesive
- 2 measures of ordinary flour
- 2 measures of wood flour (or very fine sawdust)

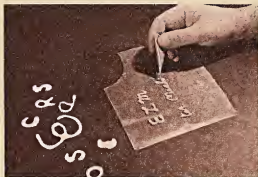
Mix the above 6 measures of material into between 2 and 3 measures of water at room temperature. The filler may be used immediately. Only enough should be mixed for from 1 to 2 hours' use. By adding only enough water to make a very stiff paste, shrinkage will be negligible.

Coloring The Plastic

Setting and hardening of the plastic is due to a delicate chemical balance which would be upset if an alkali were added. For this reason it cannot satisfactorily be extended with a material such as plaster of Paris, although the latter (as well as rubber) can be



Unusual party ornaments, like the one above, are made by coating the outside of one-cent rubber balloons with the plastic.



Above: It's easy to make ornaments, initials and monograms of plastic in any color, size or shape. Use a cake froster.



Left: Coating the jaws of spring clothespins with plastic makes them waterproof and prevents staining of clean clothing.



Left: A thin coating of liquid plastic applied to book covers gives a preservative, water-proof finish that does not become tacky. The books can then be cleaned with a damp cloth.

Right: Crack filler of plastic adhesive dries with a minimum of shrinkage. It is not affected by any paint or finish later applied.



Ornamental coasters for drinking glasses are made by shaping several plastic-coated paper disks over the bottom of a glass.



As plastic is not affected by paint solvents a little worked into the base of the brush will hold bristles in place permanently.



Bottle labels coated with liquid plastic adhesive will stand up under hard usage in the chemical or photographic laboratory.



used in making oiled molds for casting. Likewise, the colors used for tinting the plastic should be non-alkaline. Test the selected water colors beforehand with red litmus paper, which will turn blue if alkali is present.

The attractive mottled colors of modern plastics are duplicated by coloring separate quantities of the liquid plastic, gently pouring them together and stirring only enough to achieve the desired effect.

Specific molded projects and articles are not outlined here because the method is the same as that commonly used for various other materials, and because of the wealth of other variations which should be described more in detail.

Extending With Paper

In the early days of "wireless" and radio, one of the first plastics to be discovered was found invaluable for the making of dielectric forms on which coils of wire were wound. Such forms still find wide application. They are made by saturating lengths of paper with Bakelite and rolling the paper into hard, shatter-proof tubes of various sizes and lengths. Such material, made into any

[Continued on page 173]

Plastic adhesive makes an ideal sizing for wallboard and similar materials. It closes pores of surface and holds paint well.

Mechanix Illustrated

OLD MILL FOR GARDEN POOL

Does your garden somehow lack that certain "touch?" Perhaps this interesting miniature mill will provide it.

by Dick Hutchinson

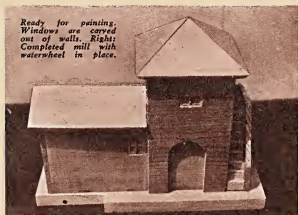
MORE and more, home owners are installing pools somewhere on the grounds each year, and with so many pools, the demand is naturally increasing constantly for unique ideas for beautifying them and adding "atmosphere." The little old-fashioned mill shown here may be just the thing that your pool (actual or planned) needs; its massive water wheel and outside tower stairs lend a very realistic appearance, as the photo at the top of the page testifies.

Right now is a good time to make the mill, so you will have it all ready to install in your garden as soon as the warm spring weather permits. Materials employed are the simplest possible, and odd scraps of lumber can be used for the most part.



Mill is very realistic. Below: Parts of the building ready for assembly.

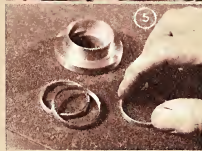
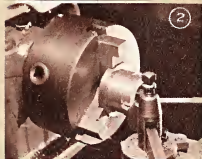
Start by making the base, which is cut to shape from pine or fir, $\frac{3}{8}$ " thick, following
[Continued on page 116]



Ready for painting. Windows are carved out of walls. Right: Completed mill with waterwheel in place.



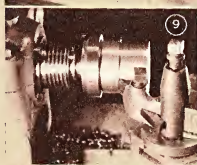
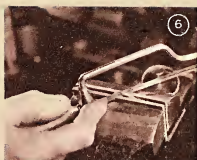
SHOP



grained, gray cast iron is the finest material that can be obtained for making piston rings. It is universally used for the rings in motors of all sizes and is best for little model engines too. It is tough and elastic, is easily machined, and wears to a mirror like surface. It is also porous enough to absorb oil, which perhaps accounts for its being the exception to the rule that like metals should not be used together on bearing surfaces.

The main essential of a piston ring is a perfect fit in the cylinder so that the pressure exerted by the ring, against the wall, will be even all around. It is quite obvious, after the ring is turned and split and when the opening made by the saw is closed, that the ring is no longer round. For this reason it is necessary to re-turn the rings in a fixture, after splitting, to obtain a truly circular form and a snug fit in the cylinder when the ring is closed. The smallest of these rings can be turned from solid cast iron bars, but rings beyond an inch or so had best be turned from cored and flanged pot castings. The use of these castings is regular full size practice, so for the $1\frac{1}{2}$ " rings shown here we may as well follow the tried and proven way. The fixture shown in the photographs and dimensioned in the drawings is for this size but can readily be changed to fit the sizes needed.

The making of these rings is started by chuck-

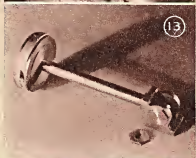




11



12



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14



15

ing the casting, flange out as in Fig. 1. This is turned, faced smooth and reversed in the chuck, Fig. 2. Here the outside of the ring is being turned to diameter while in Fig. 3 it is being bored. Fig. 4 shows the cylinder turned to size and the first ring being cut off with a parting tool. It is best at this time to cut off several extra rings; have them on hand in case of breakage. The rough edges can be smoothed down on fine emery cloth as shown in Fig. 5 and the ring brought to a close fit in the piston groove, yet free enough to expand without binding. Fig. 6 shows the ring clamped in the vise between strips of wood while being split with a thin blade hacksaw held at an angle of 45°. Fig. 7 shows a number of split rings ready to be fitted to the cylinder while the photo of the piston with its rod and cross head shows two finished rings made up for a horizontal steam engine.

In fitting these rings a fixture with a loading sleeve, to aid in clamping them tightly in place for returning, will be needed. The fixture is fully dimensioned in the drawings and can be easily made on the lathe. The body is turned from mild steel, chucked as shown in Fig. 8 and bored to receive a taper shank cut from an old drill. The shank is driven into the bored hole and the fixture slipped into the spindle nose of the lathe, Fig. 9. Here the outer end is turned to the dimensions shown in the drawings. [Continued on page 156]



16

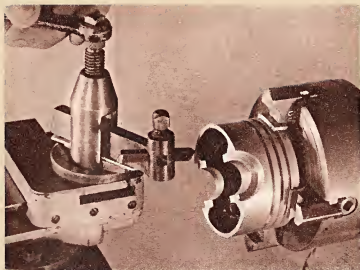


17



18





Above: Piston head chucked in lathe for smoothing off. Right: Handle holes are drilled at downward angle.



ASH TRAY made from old piston

Converted piston is attractive ash receptacle. Wash in gasoline before starting the lathe work.

AN ATTRACTIVE ash tray that will appeal to many workshop fans who own lathes can easily be turned from an old engine piston, preferably aluminum. To make it, the piston is first chucked in the lathe by the skirt, and the top and sides turned down smooth. Next, ringslots are cleaned and brightened with a parting tool. The piston is then sawed in two at the pin hole, as shown, after which the head is rechucked and the sawn surface smoothed off. A piston ring, fitted into two holes drilled in the piston's sides, forms the



handle. These holes are drilled straight through the piston, and the latter then canted on the drill to make the holes point downward. Final step is a brisk polishing.—H. H.



Gum Solvent Improves Machine Oil

OIL used for lubricating home electrical or other equipment will penetrate farther and avoid gumming if a small quantity of "motor tune-up" liquid used by garages for treating automobile lubricants is added.

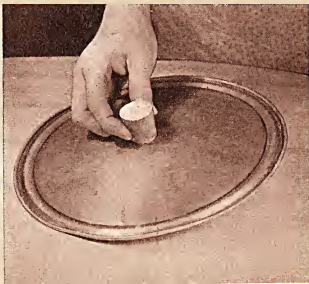


Cork Holds Spoon On Pan

TO KEEP the spoon always at hand and prevent it from slipping into the pan when cooking, cut cross notches in at right angles to each other. One notch fits over edge of pan and spoon handle fits in other.

Emergency Handle ➔

HERE'S another use for a cork. If the handle on the pot cover comes off, you can improvise one from a large cork. Fasten it to the cover with a screw inserted through the underside.



HOME



Eraser Protects Glass Cutter

FITTING a slip-on pencil eraser over the end of the glass cutter, as shown in above photo, will protect it when stored in a box with other tools, and keep the little wheel sharp.—B. N.

AIDS



Metal Flower Frog

A STRIP of sheet metal, approximately 18"x1¼", bent to shape over a pencil as shown, makes an excellent flower frog. It has the added advantage of being heavy enough so that it won't tip over easily.



Marbles Handy In Arrangement

USE sparkling marbles for another excellent method of supporting sprays of flowers in low bowls. Drop in as many as needed to support the weight, heaping them any place in the bowl as you like.—B. N.



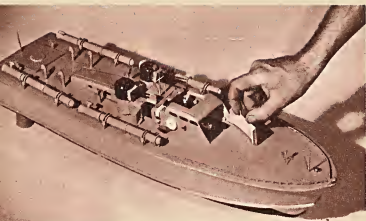
Magazine Index File

INSTEAD of looking through all the back numbers of a magazine to locate an article, you can make a neat and handy file of the indexes by simply cutting them out of the magazines—W. S.

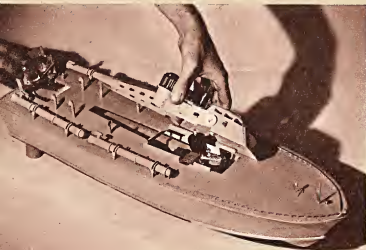


Tagged For Washing

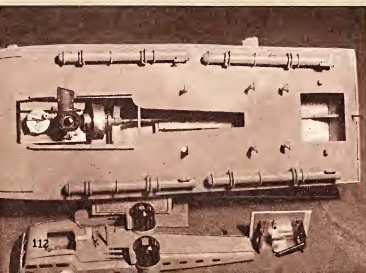
IT IS easy to misplace the tag when first wearing a dress or garment, then find you do not know just how to proceed in washing and ironing that particular fabric. So when you remove the washing instruction tag from a new garment, it is a good idea to mark it "blue dress," "green dress," etc., and hang the tag in the laundry room where it will be handy for reference when laundering time arrives.



Above: The front of the cabin is removable to provide the proper cooling for the motor. Below: The entire cabin is removed as shown for starting the motor.



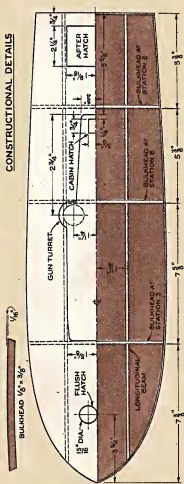
Below: With cabin and rear hatch removed you have a clear view of engine mount and battery box. Exhaust pipe extends through cabin side over deck.



PT-12 Motor Torpedo Boat

Part Two

Here's how to complete and test her!



The drawing above shows the location of hull and deck details and hull bulkheads.

IF YOU followed the instructions in the previous installment (February MI) on the construction of this model PT Boat, you're just about ready to build the superstructure. Don't forget to leave your motor mount free in the hull so that you can set the motor in the high section of the cabin. And another thing—don't put celluloid or plicofilm in the windows when you build the cabin. You may think it would look nice, but those windows should be left open for thorough cooling of the motor.

The cabin structure itself, is quite simple. Cut out the sides first, using $\frac{1}{8}$ " birch plywood in order to gain a maximum motor clearance with super rigidity. The gun turrets are of the same material, bent and cemented into a cylinder. The transparent turret tops are two plastic model airplane gas tanks trimmed to proper height and striped with black paint. Balsa shields and wood dowel guns turned down to simulate real machine guns complete them. The torpedo tubes are $\frac{1}{2}$ " wood dowel; each has 3 balsa rings $\frac{1}{8}$ " thick plus two more rings cut in half and fastened to the top of the support cut from scrap stock. The expansion valves are also turned dowel and scrap balsa. (Refer to plans.)

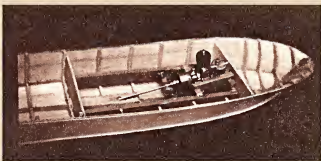
The pilot cabin top surrounding the bridge is of cemented $\frac{1}{4}$ " sheet balsa because it must be rounded off. The front is of the same material with window posts set in.

Cut the deck from suitable light stock such as $\frac{1}{4}$ " white pine or bristol board, etc. The original had $\frac{1}{8}$ " birch plywood with stringers. The rear hatch cover is cut slightly undersized from the deck and laminated to $\frac{1}{8}$ " scrap balsa which is hinged to the deck. A model airplane battery box is fastened to its underside. The cabin section is cut from the deck slightly undersized, say $\frac{3}{8}$ " inside the cabin outline and this is cemented to two $\frac{1}{4}$ "x $\frac{1}{8}$ " balsa strips that will sand off easily at the edges, forming the cabin top.

Now add $\frac{1}{8}$ " square deck
[Continued on page 142]



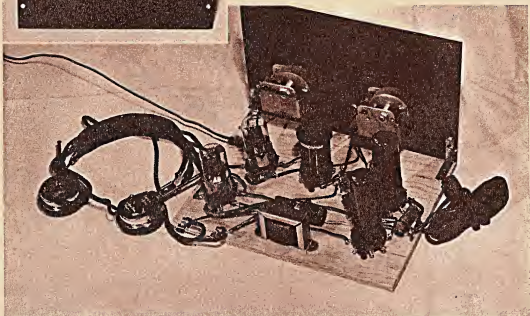
Above: Motor is started by means of tape or thong wrapped around fly wheel. Do this with the boat in water to prevent excessive vibration.



Completed hull (except for deck) with engine installed is shown above. Note how stringers are mounted in bulkheads to carry mount. Be sure motor is mounted to fit into high part of cabin shown below. Turrets are made separately, then attached, using plenty of waterproof cement.



Progressive Regenerative Receiver



Study the layout photo above and the diagram opposite carefully before starting construction. This little set will bring in stations from all over the world.

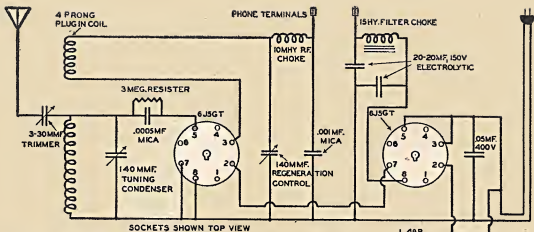
THE short wave bands are coming in for a lot of use lately. Everyone wants to listen in to broadcasts from overseas, especially to those nations where the regular news services have been discontinued. Not all of us can afford to build or buy a complex short wave receiver. The one we are about to describe will appeal to many of our radio minded readers.

This receiver was designed to have a dual appeal. The circuit as presented this month is simple to build, uses inexpensive parts and is intended for headphone use only. Next month, for the benefit of "loudspeaker fans" we will show how, with but a few simple circuit changes, this receiver will operate a loudspeaker. The set operates from either a 110 volt AC or DC circuit. The usual AC-DC resistance line cord is dispensed with. Instead, two ballast tubes are used which can be bought for only 10 cents each. Plug in coils are used to change bands. Since they are available already wound, at a nominal

cost, the tedious job of winding your own coils is eliminated. A 6J5GT tube is used in a regenerative circuit. This tube is one of the smoothest acting regenerative tubes made. Another 6J5GT tube is used as high voltage rectifier. This may seem unorthodox but we had a purpose in doing it. For headphone use, it easily passes the current required as a rectifier. In the loudspeaker version next month this tube will be used as an audio amplifier. A total of 40 mfd. of capacity is used in the filter circuit. Absolutely no hum is heard in the headphones.

Two 140 mf. variable condensers serve as tuning and regeneration control. Although plain round knobs are used on both of these condensers, easier tuning on the short wave bands may be accomplished by installing a vernier dial on the tuning condenser.

Broadboard style of mounting the parts is used, because it is the easiest way. The front panel is made of crackle finish masonite and is easily drilled. Mount the two variable con-



condensers on the masonite panels, so that it will have a balanced appearance. Mount the sockets and other parts on the baseboard approximately as they appear in the photograph. The important thing is that the coil socket and socket for the first 6J5GT tube (the detector tube)

should be mounted in such a way that those leads carrying radio frequency current be as short as possible. This requires a little study and ingenuity on your part but a pretty good idea can be had from the photograph. Short leads are not important at the lower frequencies, but if you want to use this set all the way up to the highest frequency at which it is capable of operating, the length of leads are important. The lead lengths on the balance of the circuit are not important. In fact, we suggest that you spread the balance of the circuit out over a fairly large board so that you can clearly see what you are doing. The baseboard in this receiver measures 8"x10". The panel is a standard 7"x10" size. A Fahnestock clip for antenna is mounted at the right of the board (looking at it from the front of the panel) close to the detector tube. No ground is used and *absolutely must not be used*, as a ground return is obtained through the supply line. Two Fahnestock clips for phones are mounted along the back edge near the right corner.

Wiring is straightforward and the diagram easy to follow. There is only one precaution. The connections must be soldered properly using *rosin core solder only*, never rosin paste

Parts List

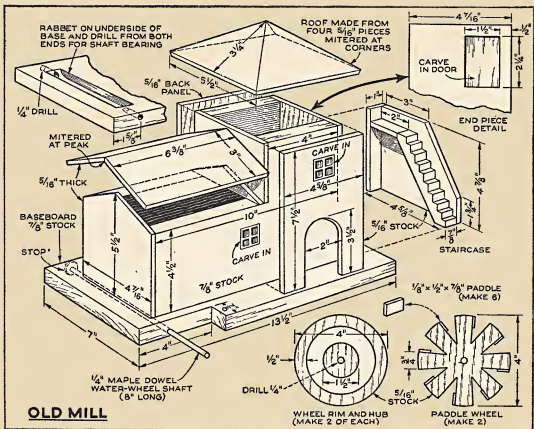
- 1 3-30 mmfd. trimmer condenser (Allied 60-330)
- 1 140 mmfd. variable condenser (Allied 1N127)
- 1 .0005 mfd. mica condenser
- 1 .001 mfd. mica condenser
- 1 20-20 mfd. 150 volt electrolytic
- 1 .05 mfd. 450 volt tubular condenser
- 1 3 megohm 1/2 watt resistor
- 1 15 henry midget filter choke (Allied 62-018)
- 1 10 mhy R.F. choke (Allied 60-604)
- 1 Octal wafer socket
- 1 7"x10" Masonite panel
- 1 Line cord with plug
- 1 3" dial 0-100 Allied 55-330
- 1 Set of 2 plug-in broadcast coils 4 prong (150-550 meters; Allied 60-671)
- 1 Set of 4 plug-in short wave coils 4 prong (9.5-217 meters; Allied 60-670)
- 2 Knight 6J5GT tubes
- 2 Knight octal base glass L49B ballast tubes (special value Allied 55-035)
- 1 Miscellaneous hardware (14, 1/4" spacers for sockets and tuning condensers; 2, 1/2" brackets for panels; 4, 1" 6-32 machine screws; 1, 1/2" 6-32 machine screw for panel; 4, 6-32 nuts; 11, 3/8" No. 6 wood screws; 10, 3/8" No. 6 wood screws; 1, double wiring tie-point; 3 Fahnestock clips; hookup wire; solder).

or acid fluxes. Acids will corrode copper in practically no time at all. Rosin pastes have a slight corrosive effect and will result in noisy operation after a time. The rosin in rosin core solder is the purest flux obtainable.

Make all connections directly from one point to another. If the length of the leads on the fixed condensers and resistors are longer than needed, cut off the excess amount. Do not make splices "up in the air." All leads should end at a socket or other wiring terminal. One insulated wiring tie-point was used at the line cord. Where necessary the unused contacts on sockets may be used for anchoring purposes. Use a hot well tinned iron and apply it to the connection to be soldered. Hold it there until the connection itself is hot enough to flow the solder. Apply only enough solder to make a good bond.

All you need now is a good antenna and you are ready to "listen in." The antenna may be any single wire standard type of from 100 to 150 feet long. It should be in the form of an inverted "L" with the flat top portion mounted as high as possible, outdoors. Good glass or porcelain insulators should be used at the end of the flat top portion. Number 12

[Continued on page 161]



Old Mill For Garden Pool

[Continued from page 105]

the dimensions given in the perspective drawing. A slot $\frac{5}{8}$ " deep is rabbeted in the underside, $1\frac{3}{8}$ " in from one end of the base, with solid wood left at either end of the slot itself. This facilitates drilling the quarter-inch bearing hole in the base



Top: Perspective assembly plan of mill with dimensions. Set mill where there is a current and wheel will turn.

which holds the water-wheel shaft. A detail of this part of the construction is shown in the drawing.

The two side pieces for the building are next, and are also of $\frac{7}{8}$ " pine. All other parts (except stairs) are made from $\frac{5}{16}$ " pine. Assembly is accomplished with galvanized finishing nails and Cascamite waterproof glue. Joints should be well coated with the glue then nailed together tightly. A little glue should be seen to squeeze out of the joints. Drive the nail heads just below the surface and fill with putty or plastic wood.

The stairs are formed by sawing notches in a $1\frac{1}{2}$ " wide strip of the $\frac{7}{8}$ " thick pine. The windows and second story tower door are drawn on the wood in pencil, then carved out.

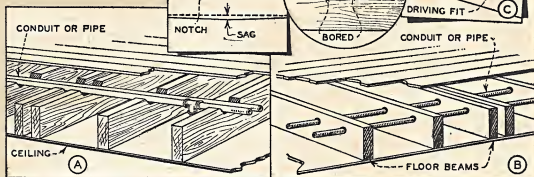
Cut out the waterwheel as shown from a small scrap of marine plywood, or solid wood if you prefer, and assemble it with brads and more waterproof glue. After glueing the wheel to the shaft, shellac the latter, slip it into place in the base and glue the stop on the other end.

A couple of sample strips of red slate-surface roofing may be obtained at most any lumber yard. Cut pieces of this to fit the roof, allowing $\frac{3}{8}$ " to overhang all around. Nail on with small, flathead nails. Cut strips $1\frac{1}{2}$ " wide, fit and nail over the ridges.

[Continued on page 168]

SAVING HOUSE FRAMING

HOUSEHOLD



HOUSE framing members that have been critically weakened by undue notching and cutting away of the wood during the installation of plumbing and wiring are often the cause of damaging structural settlement. The occurrence of plaster cracks in walls and ceilings affected by the sagging members are a common result. Springy and creaky floors are another.

For example, the time saving but dangerous practice of notching out the tops of floor joists to receive pipes or conduits definitely weakens

[Continued on page 164]

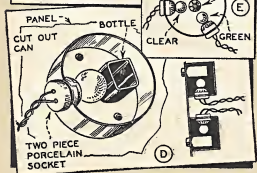
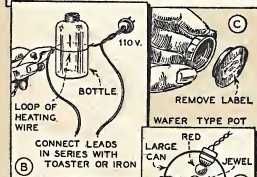
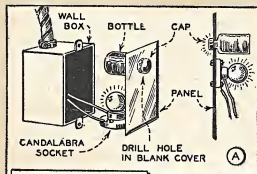
Pilot Light Kinks

THERE are several common odds and ends that can be used to advantage for building inexpensive homemade pilot light devices.

Small bottles with translucent screw caps, for example, can be readily mounted on blank covers of conduit boxes or on sheet metal indicator panels as shown at A. The bottle serves to pick up light from the concealed lamp and transmit it to the cap which acts as the jewel. Before screwing the cap in place, remove the cork or foil disk washer and clean out any deposit that might obstruct the light. If the bottle is too long to fit into the space allotted to it, cut off the bottom end by scoring the glass with a file or with a loop of heating wire as at B. Then dip the bottle in cold water to break off the waste.

Wafer type translucent rouge and eye shadow pots, which are made in a variety of

[Continued on page 164]



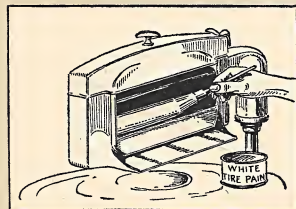
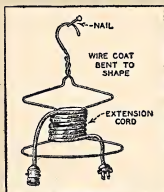


Ironing Boards Easily Moved

A PAIR of ordinary furniture casters mounted as shown, make it much easier to move your ironing board.

Cord Winder

EXTENSION cords won't get tangled if wound on a reel like the one shown. Merely bend an old coat hanger to the shape indicated. It hangs up with cord.—A. H. W.



Wax Pencil Labels Preserve Jars

THE work of labeling jars can be greatly reduced by using wax China marking crayons instead of labels.

Safety Guard For Scissors

A PIECE OF RUBBER TUBING SLIPPED OVER SHEARS

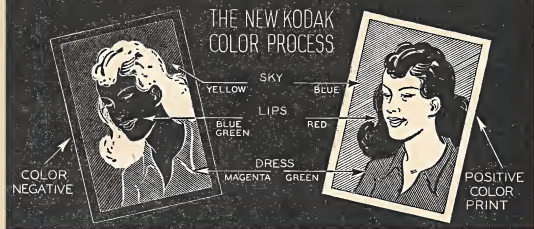


HOUSEHOLD shears and scissors lose most of their accident danger if their sharp tips are inserted in a short piece of garden hose as shown, when not in use.—A. H. W.

Preserving Wringers

A GOOD surface can be kept on wash wringer rollers by painting them occasionally with the liquid rubber type of white-wall auto tire paint.—A. H. W.

KODACOLOR ALBUM PRINTS



Kodacolor is a negative-positive color process. The exposed film is returned after processing in the form of a negative—with light areas dark and dark areas light and the colors complementary to the original. In the print, colors are natural.

FULL-COLOR snapshots, on paper . . . and in the various popular rollfilm sizes!

That has been the dream of amateur photographers since 35mm Kodachrome transparencies first came on the scene back in 1935. And now the dream is a reality. The Eastman Kodak Company has announced and just begun to market the new Kodacolor process.

Unlike Kodachrome and the related Minicolor and Kotavachrome printing methods, Kodacolor is a negative-positive process. You send your exposed roll of color film to the Eastman Kodak Company for processing, and the photographs on the roll are returned in negative form—dark areas are light and light areas dark; and the colors are complementary to the subject's original colors. (Blue sky turns out yellow on the negative; red lips are blue-green, etc.)

You then order as many prints as you want from each negative, and in each case the reverse-colored negative is returned to you for further printing at any time in the future. The Kodacolor print has a paper backing like ordinary black and white photographs, and it presents all the colors and brilliances of the original scene in their normal order and relationship.

For the time being, Kodacolor will be available only in the six more popular roll-

film sizes: 116, 616, 120, 620, 122, and 127. And it can be used in any camera taking one of these sizes, whether a box Brownie, a Rollei-flex, or a Medalist. The rolls are numbered so that full-frame, half-frame, or square pictures may be made in the various sizes. The film cost ranges from \$1.25 for the 127 vest-pocket roll to \$2.40 for the 122, 3A size, and it includes processing of the negative at the Eastman Kodak color laboratories. It does not include prints. The latter cost 40c each additionally.

To simplify and expedite processing as much as possible, it has been decided to limit all prints to a standard width—2 $\frac{7}{8}$ inches. The length of the print will be in direct proportion to the longer dimension of the negative from which the particular print is made, and the price will hold throughout at 40 cents.

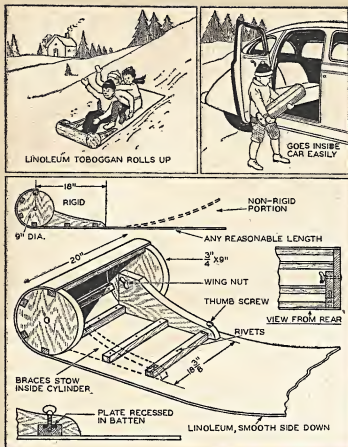
Kodacolor film has a bit more exposure latitude than Kodachrome, and it is appreciably faster. When using a meter, Kodacolor is rated at Weston 20, or General Electric 32. Exposure directions enclosed with each roll suggest that average subjects in bright summer sun (with light coming from the front or side) be exposed at $f/11$ and $1/50$ th second. Thus, if the camera is equipped with a lens as fast as $f/3.5$, a shutter speed as short as $1/500$ second can be employed to freeze motion.

[Continued on page 162]

by Hi Sibley

Linoleum Toboggan Rolls Up

HERE'S a toboggan you can roll up and carry in the car, or even under your arm, over to the coasting hill. When you start sliding down, the toboggan will speed along, undulating over snow, following bumps and depressions. The bottom is made of a heavy strip of linoleum, preferably of the "battleship" type, smooth side down. It should be well waxed before using. The curved front end serves the same purpose as the one on a regular spruce toboggan. Any scrap lumber may be used for this part, and the circular pieces can be cut with a coping saw. Wing nuts and thumb screws make for quick assembly, and simplicity of construction is clearly shown in the drawing.

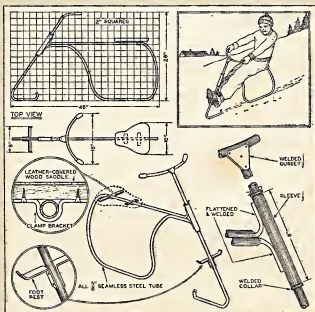


"Hill Skate"—A Single Track Coaster

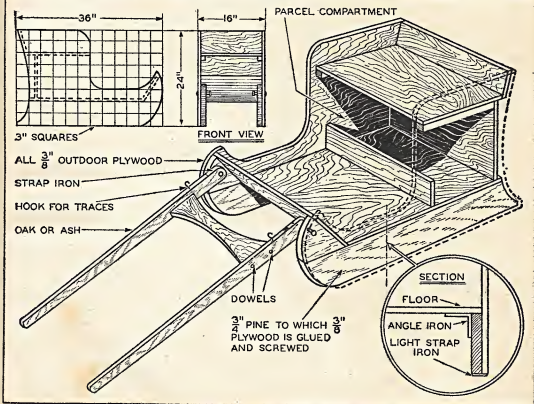
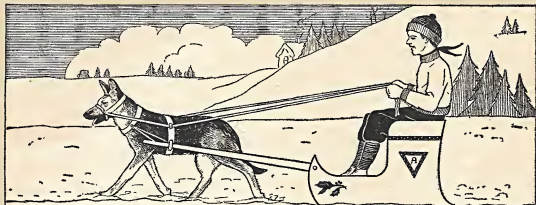
THIS light and sturdy coaster for ice or hard-packed snow is easily built, being made of seamless steel tubing bent to the shape shown in the squared diagram, and welded where indicated.

Tubing may be obtained at a bicycle shop and should have a fairly thin wall—about $\frac{1}{16}$ ". Heat in a forge or blowtorch for bending and do it gradually, a short section at a time.

The seat should have rounded edges and be covered with leather, and the handlebars should have cork or leather grips to protect hands against cold. Locate footrests to suit length of leg and weld on or fasten with through-bolts.



FOR WINTER SPORT

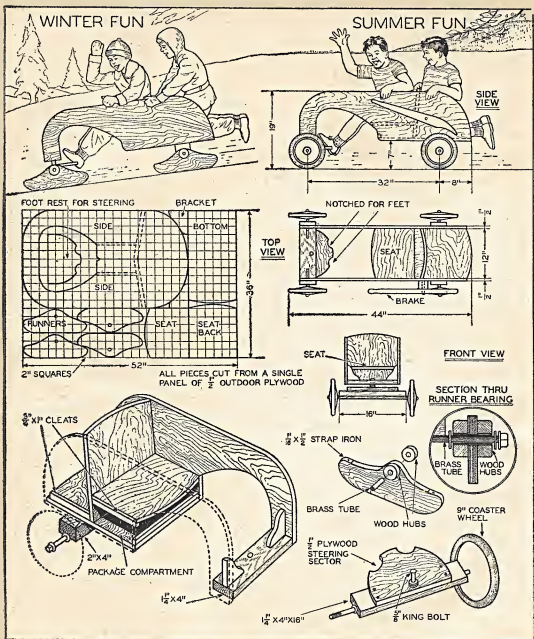


"Musher," Lightweight Dog Sled

WITH well-packed snow the effort required to pull a loaded sled is so negligible that even a medium-sized dog can manage easily. Being made of outdoor plywood this sled is strong as well as light and is designed with a parcel compartment under the seat. Sides are one-piece scroll-sawed $\frac{3}{8}$ " ply-

wood, with pine boards glued and screwed on the inside of each runner and shod with light strap iron. Shafts are detachable, should one wish to pull it with a rope. A Chinese red paint job is effective if set off with some decoration or decalcomania design in harmonious colors. Paint floor and seat gray.

YEAR-ROUND COASTER



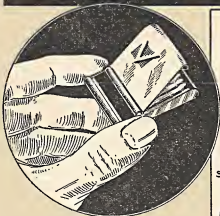
AS SOON as the snow has gone and walks are dry you simply replace the winter runners of this two-place coaster with wheels and keep on with your fun.

Note that all members of the body are cut from a single panel of half-inch outdoor plywood, laid out in the squared profiles. Assembly is with screws and casein glue, with cleats

installed where indicated. In order that short turns can be made, the foot rest for steering is cut in a semi-circle, permitting the feet to swing in a wide angle without interference with the fixed cross-member just above the axle.

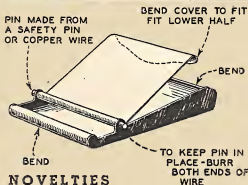
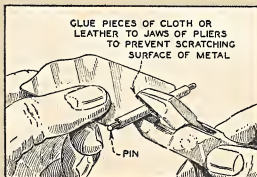
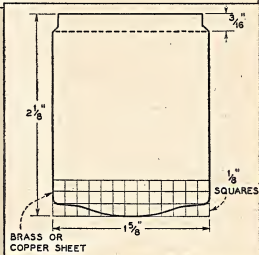
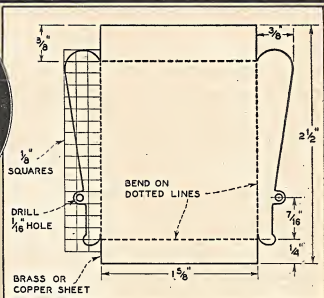
For use with wheels, a brake on one side, or
[Continued on page 164]

BOOK MATCH METAL CASE



by Nathan Bogoch

A NEAT, initialed, polished metal case for your book matches not only prevents them from getting accidentally crushed, but also greatly lessens the fire hazard in using them. The case illustrated can be made from any scrap of sheet metal, preferably copper or brass, and the only tools required are shears, a pocket knife, small drill and a pair of pliers. If you have a buffing wheel to polish the case, so much the better, but this is not absolutely necessary as an excellent shining-up job can be done by hand. Mark the pattern shown on cardboard, cut to shape and use this as a template to transfer to the metal. Cut the metal with the shears, and bend with pliers along dotted lines. Prepare the pliers as indicated to avoid marring the metal. Assemble the cover to the body with a pin hinge, burred at the ends to hold it in place. A drop of solder at each end will also do the trick. Cut desired initial in cover.



NOVELTIES

THE SCHOOL SHOP

Conducted by Frank Petraglia,
Shop Instructor, Samuel Compers Industrial High School
New York City

FLASHES FROM THE SCHOOL REPORTER

IF ANY of you fellows happened to overlook that "Whiz Kids" article in the January issue of *MI*, drop everything and read it! I'm sure all of us were thinking of one thing as that amazing story unfolded: what a treat it would be to get into that lab . . . However, that's not impossible. The article tells you what you must do to apply. Do I see any hands raised? If you have been working experimentally, just assemble your data and let the AIS Laboratory know about it . . . From the industrial arts class at Stellarton High School, Nova Scotia, Leo McDonald reports on

STUDENTS' PROBLEM BOX

- 1—Q. How may cracks in an enameled surface be filled?
A. Procure sealing wax to match the color of the enamel. Then work a small quantity into the crack with a flexible piece of metal, such as a palette knife. A thin coat of color may now be applied.
- 2—Q. What satisfactory substitute may be used for regular lamp wicks?
A. An old felt hat will serve admirably here. Cut strips, across the hat, and soak these in vinegar for two hours. Dry the strips out of doors. After drying, they are ready for use.
- 3—Q. I would like to convert some large chunks of solder into convenient strings. How may this be done?
A. This may be accomplished by drilling a small hole near the upper edge of a ladle. Melt the solder, then pour through the hole on a slab of stone or slate to harden.
- 4—Q. Is there any way of muffling the sound of a loud ticking clock?
A. A clock cannot be easily muffled by adjustment of the inner mechanism. However, a large transparent glass jar placed over the clock will provide dampening of the sound.
- 5—Q. What simple but efficient cleaning solution can be used for cleaning silverware?
A. Place a small piece of zinc in a dish or bowl of glazed ware. Then place articles to be cleaned into it and, pour over them a hot solution of water and washing soda in proportions of 1 tablespoonful to $\frac{1}{2}$ gal. of water. This common solution is used by most jewelers.
- 6—Q. It is often necessary to siphon gasoline from a container. Obviously, starting the siphon with the mouth has disadvantages. Is there some way of starting the flow of liquid without getting a mouthful?
A. Yes. Simply roll the hose flat, with one end in the gas or other liquid. Then release the hose suddenly. The abrupt intake of air into the hose will start a suction and start the flow.

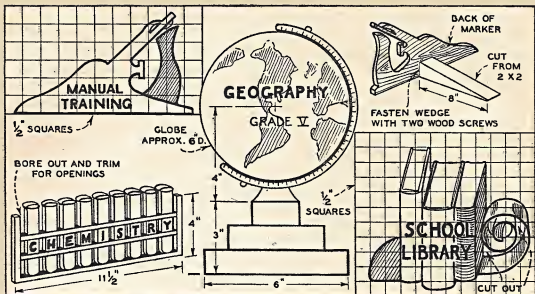
some of the projects completed recently. These include modern book-ends, envelope cases, candleholders, and similar articles. Mr. Grant McGregor is class instructor . . . Tom Jaskowiak, machine-shop class, Middlesex County Voc. H. S., Perth Amboy, N. J., says there are 24 students, all doing good work. Some are working on a 6-inch shaper for the school's "General Shop" and others are making motor drives for the shop machines . . . Irwin Leitner reports from Brooklyn Tech, N. Y. C. His subject is pattern-making. B'klyn. Tech has a great variety of shops, including welding and forging. The school clubs include Chemistry, Radio, Television, Camera and Physics . . . From Lafayette, Alabama, Icie Ellis reports for the Boys Craft Club. The last two projects which they have completed are a drafting machine and a kitchen set, both very useful . . . Mr. Williams is instructor in Machine Shop at Manhattan H. S. of Aviation Trades, N. Y. C. Joseph Confino is our "SS" representative here. Joe has asked us about contributing regular mechanical material to the "SS." Well, everyone is welcome. If you've worked up some useful device, or invented something, or improved upon some operation, send the data into this department, by all means. All material accepted for publication is paid for, too. So, don't delay, if you have something to submit . . . Incidentally, how many of you fellows have seen the new "molecule boxes" which have been put on the market? They're great fun. Ask your shop instructor to show you one . . . Avoid dictionaries department:—Here's the best definition of FM and AM we've run across. It comes from a report of the FCC and follows here capsule-like:

"Modulation is a process of imparting sound or other signal (intelligence) to a transmitted radio wave. The radio wave has two defining characteristics—amplitude and frequency. With amplitude modulation the sound controls the amplitude of the radio wave transmitted, while the frequency remains constant. In contrast, frequency modulation varies the frequency of the radio wave while the amplitude remains constant." Get it? We thought you would . . . Before dismissing class for this period, let us welcome George Duvall of Towson H. S., Towson, Md., and Fred Eckert, Jr., of Port Jervis, N. Y. That's all for today . . .

With the war making metals and some other materials virtually unavailable for general consumption, shop students and hobbyists are going to have to turn more to woodworking. With this thought in mind we'll bring you a special woodworking section in the April issue which you won't want to miss. Watch for it.

Mechanix Illustrated

Projects For Students and Teachers



CLASSROOM MARKER—DOORSTOPS

A USEFUL and novel project, well suited to the ability and special interest of school crafts or woodworking groups are combination classroom markers and doorstops. This project, although simple, is one in which the pupils' ingenuity may be exercised.

The idea makes use of the old wedge-type doorstop, with the perpendicular piece cut to an appropriate design to designate a particular school classroom or subject.

Scrap materials left from the woodworking projects, packing boxes, plywood and even stiff composition wall board may be used for the upright section. The construction of this item is very simple as the following steps indicate:

1. Trace project on wood from paper pattern or sketch free hand.
2. Cut out with coping or jig saw and drill. Base cut from 2" by 2" stock.
3. Sand.
4. Secure base using one inch brads or small screws.
5. Draw in detail of design on front surface.
6. Paint.

THE SCHOOL SHOP NEEDS REPORTERS

If you would like to be a reporter for your shop group or school, just indicate this briefly on a postcard. Address **MECHANIX ILLUSTRATED**, 1501 Broadway, New York, N. Y.

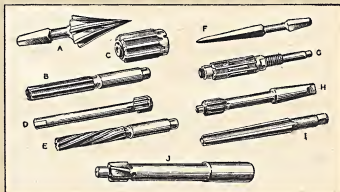
7. Letter after paint is thoroughly dry.

Bright but appropriate colors should be used with the lettering done in contrasting colors.

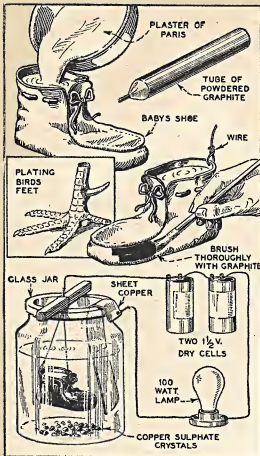
The suggested designs for classroom marker doorstops shown are only a few of a wide variety of possibilities which are not only of use and interest to pupils and teachers, but also prove to be of great assistance to visiting parents.

A piece of stiff wire may be utilized to make a pencil compass which is every bit as practical as regular commercial types. Simply wind a few turns around the pencil, depending upon the radius desired. The lower, pivoting end of this improvised compass may be filed to a point for better results.—Roger M. Woodbury.

HOW MANY OF THESE REAMERS CAN YOU IDENTIFY?



Your Craft Test is a fairly tough one this month. Score ten points for each correct answer. If you make 70 or better you belong in an ordnance plant. Turn to page 161 for answers.



ELECTROPLATING BABY SHOES

AS ALL you school shop students should know, electroplating is the art of applying a coating of metal to the surface of another substance—usually metal—but not necessarily so. This plating is deposited on an article by the process known as electrodeposition.

When metals are to be electroplated, cleanliness of the parts is the first requisite. Metals conduct electricity easily so it is not necessary to treat a metal body as one would have to treat an object which is not electrically conductive.

Cloth, leather, and other non-conducting substances, therefore, can only be electroplated if they are first made electrically conductive. This may be done, without difficulty, by applying a layer of a conductor. For most purposes, graphite—that material which is found in lead pencils—solves the problem admirably.

Every mother highly prizes baby's first shoes, and is likely to be skeptical about the metallizing process in the hands of an amateur.

In any case it is advisable first to treat a small

piece of material similar to that of the baby's shoes. If a satisfactory metal coat is produced on that piece of material—and it should be if you follow instructions—your results with the whole shoe should be equally as good.

As stated before, the material must first be made conductive. This is accomplished by brushing on a layer of ordinary powdered graphite. Graphite can be obtained in any automobile supply store for only 10 cents. It is generally used as a lubricant for locks. Consequently, it comes in a celluloid or similar tube so arranged that when the sides are squeezed a small amount of graphite can be blown into the tumbler mechanism of the automobile or other locks.

Blow a small quantity of this graphite on the surface of the leather and with a fine brush work well into the material. Continue this operation over the entire surface of the leather. Remember that unless everything is coated with a well rubbed-in and shiny layer of graphite you will not get a perfect coating of metal. Avoid handling with greasy fingers.

A bare piece of copper wire is then pushed through any suitable hole in the fabric and this is twisted around the material tightly so that it makes contact with the graphite coating. Loop this wire around the stick and then connect it to the negative or outside post of a dry cell, as shown in the illustration.

Connect the middle post of the dry cell with a piece of bare copper wire to the outside of a second cell and then connect the midpost of this second cell to one side of a lamp socket.

Because of simplicity of the solutions, availability of materials and the generally satisfactory results, pure copper will be applied to the shoe by the electroplating process. For this we will need about a quarter of a pound of ordinary copper sulphate. This may be purchased at the drug store or the druggist will order it for you. It is not expensive.

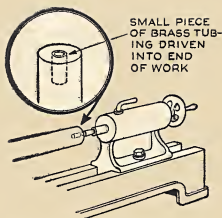
Dissolve as much copper sulphate as you can in a sufficient quantity of water to cover the article which is to be plated. Then insert into the solution a strip of pure copper and connect this with copper wire to the other post of the lamp socket. Into the lamp socket screw a 100-watt bulb. As soon as you do this you have completed the circuit and the electroplating action commences.

The lamp acts merely as a resistance in this circuit and controls the amount of current supplied to the solution.

If you find the test satisfactory on your test sample you can proceed with the baby's shoes. In order to maintain their shape the baby's shoe should first be filled with plaster of Paris. Mix the white powder with water, making a thick but flowing mixture, and pour this into the shoe. It will harden in a few minutes. Now treat both the surface of the shoe and the plaster of Paris with graphite and proceed with your plating the same way that you did with your test sample.

METALLIZING BIRD'S FEET

Chicken and turkey feet, as well as the feet of any other birds, can be metallized by following the same procedure. The foot of the bird is permitted to dry for a week or so, after which the entire surface must be coated with graphite. Metallized birds' feet make an interesting project for clubs. A good collection, mounted on wooden blocks, is ornamental and instructive.



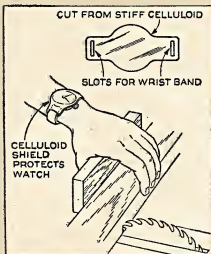
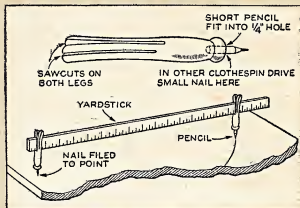
Workshop Aids

Centering Lathe Work Accurately

THE pressure of the tool and the speed of the lathe generally tends to wear the tail stock center and enlarge the hole in the end of the piece being turned. This is especially true of softer woods, where it makes accuracy difficult and the turning process even a bit dangerous. It is a good idea to have some scrap metal tubing handy when wood turning, to insert in the end-center of the work. Bore a hole about one-half inch deep and a driving fit for the tubing. If kept oiled, the tubing will work on the point of the center with little friction or wear.

Clothespin Points For Yardstick Compass

HERE is a method of drawing large circles that is a great improvement over the usual stick-string system. Two clothespins, with open ends split as shown, and solid ends fitted with a sharpened nail and pencil, respectively, are slipped on a yardstick. The stick forms the compass arm, and an accurate circle of any desired size can be obtained.

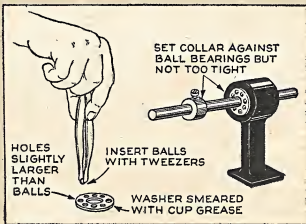


Celluloid Protects Wrist Watch

YOU can wear your wrist watch around the workshop safely if you make one of these little protectors. Cut it from heavy sheet celluloid to the shape shown and slip it on the strap and over the watch's face. The shield must be slightly wider than the watch so that it will protect the sides of the case as well as the face.

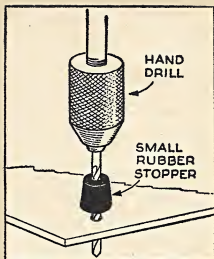
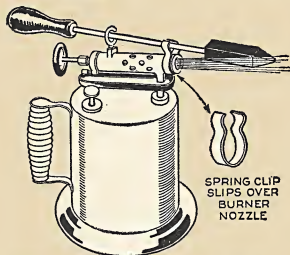
Making Thrust Washer →

IF YOU have need of a specially sized thrust washer for some particular job, you can make one from an ordinary washer and a few loose ball bearings. Drill holes in the washer, insert the balls in grease, place on shaft and hold assembly with a set-screw collar, as in sketch.



Heating Iron With Blow Torch

MOST blow torches are equipped with a hook that is supposed to go over the shank of a soldering iron to hold it in place for heating. However, it takes time and trouble to balance the iron so it won't fall off on one side or the other. A clip made of an old piece of flat spring metal shaped as indicated below will solve the problem. The clip is sprung over the nozzle of the blow torch and forms a non-slip rest for the soldering iron. When not needed the clip can easily be removed.



Rubber Stopper On Drill

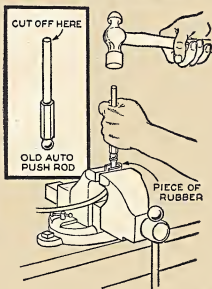
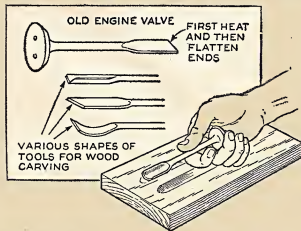
SMALL steel twist drills used in hand drills or braces can be preserved from all too common breakage by placing a small hard rubber bottle stopper on their shanks. They also act as depth gauge.

Tube Flanger From Push Rod

HOME mechanics will find an old push rod from a junked car engine an excellent flanger for copper or other metal tubing. Place the tubing to be flanged in a vise and tap ball end of push rod into tube.

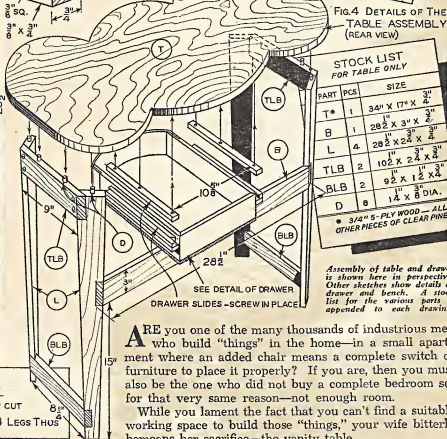
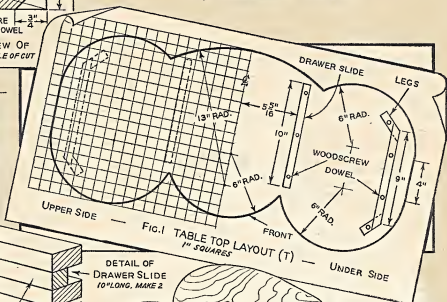
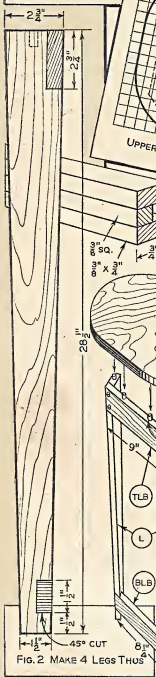
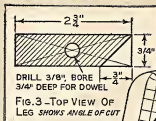
Carving Tools From Motor Valves

AN EXCELLENT set of custom made wood carving tools can be shaped from a few old engine valves. The condition of the valve head is unimportant, as it merely forms the handle. Draw the temper from the valves by heating to a cherry red, then flatten the stems with a hammer. Reheat and shape the desired tools. Grind to sharp edges, heat again and retemper by plunging into an oil bath. Very fine tools will result.



KIDNEY TABLE

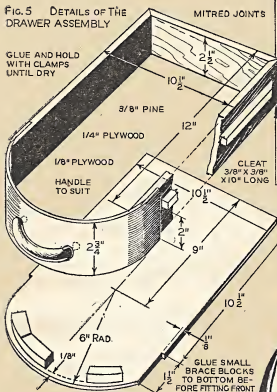
by Stephen Cavell



And BENCH

Make a hit with the "little woman" by building her this unusual vanity set.

FIG. 5 DETAILS OF THE DRAWER ASSEMBLY



STOCK LIST — FOR DRAWER ONLY

PART	PCS.	SIZE	KIND
BOTTOM	1	15" x 10 1/2" x 1 1/8"	PLYWOOD
FRONT	1	15" x 3 3/4" x 1 1/8"	3-PLYWOOD
SIDES	2	12" x 2 1/2" x 3/8"	CLEAR PINE
BACK	1	10 1/2" x 1 1/2" x 3/8"	CLEAR PINE

2 CLEATS 10" x 3/8".
1 HANDLE — TO SUIT

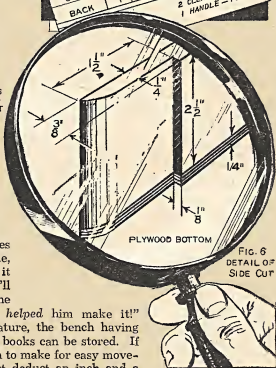
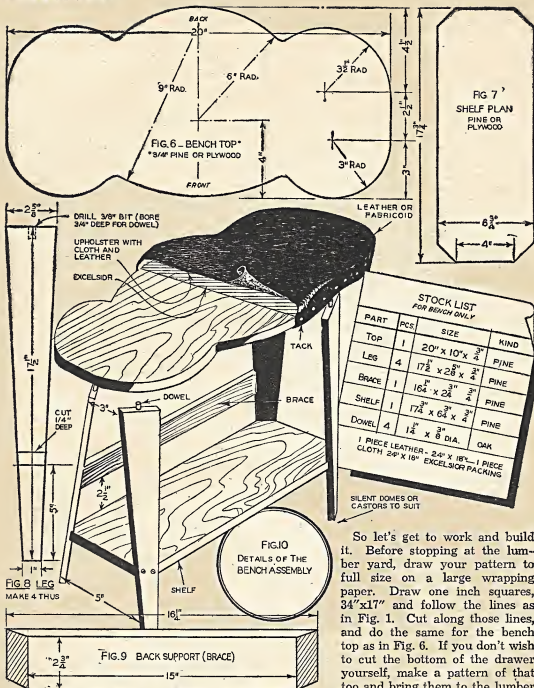


FIG. 6
DETAIL OF
SIDE CUT

The kidney table and bench is an almost perfect substitute for the vanity and it is fast growing in popularity for all those residing in small apartments. It only takes a third of the room required of the vanity.

Your wife frowns when you start littering up the rooms with wood shavings—why not change that to smiles and build her this beautiful, yet simple, kidney table and bench. She'll like it doubly because when you're finished, she'll have the job of making the skirt for the table—then she'll say with pride, "I helped him make it!"

This particular design has an added feature, the bench having a shelf below the seat where those bedside books can be stored. If you wish, castors may be added to the bench to make for easy movement when loaded down with books. Just deduct an inch and a



half from the bench legs in the plans and add the castors.

Perhaps the most attractive part of the whole project is its low cost. You shouldn't have to pay more than \$5.00 to \$7.00 for the lumber and perhaps \$2.50 for the material for the skirt.

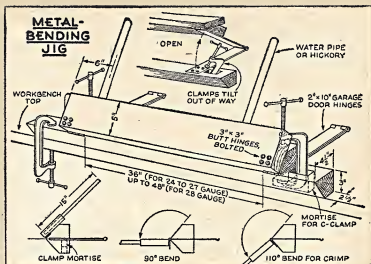
dealer together with your lumber list.

Re-read the excellent article by Ben A. Ott, "How To Select And Buy Lumber" contained in the October, 1941 issue of *MECHANIX ILLUSTRATED*, so that you will be able to speak intelligently to your lumber dealer. He'll

[Continued on page 172]

METAL JIG

HERE is an easily assembled aid to sheet-metal working that may be carried around in your car and set up for operation almost instantly on any strong bench. Since standard C clamps are used to hold the jig down they may be returned to their everyday work when not needed on this tool. Tough wood that is well-seasoned and therefore not apt to warp is recommended, and the balance of the materials (one pair 3"x3" butt hinges, and one pair of 2"x10" strap hinges, minimum), are obtainable anywhere. When assembling the jig mortise the strap hinges so that the wooden jaws of the clamp part exactly flush on the leading edge, and mortise the butt hinges so that the pins are centered with the leading edge of the closed wooden



clamps. The bottom board is mortised to take available clamps as indicated. Do not use clamps so large that you have to chisel away too much for them as that will weaken the apparatus. The large perspective drawing shows construction and assembly of the jig, or brake, clearly, and the three small end views explain its operation.—W. Keith Vining.

CUTTING A THREAD ON ANY LATHE

NO MATTER what type of lathe you have, you can cut *any* desired thread easily, and with accuracy equal to that of the most costly precision equipment, without investing one dollar! Even a wood-turning lathe will do, if speed is reduced to around 30 to 50 r.p.m. by means of an extra jack-shaft or two.

A recent defense order in a small shop necessitated several hundred 6" lead screws, $\frac{1}{16}$ " diameter, with 1-millimeter threads—

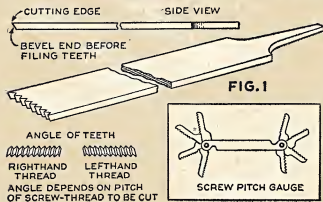
and not a lathe in the shop was equipped for cutting metric screws, nor could a set of metric transposing gears be obtained in time to complete the job on schedule.

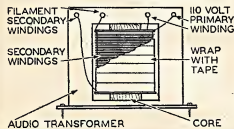
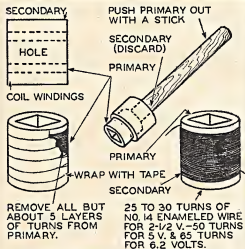
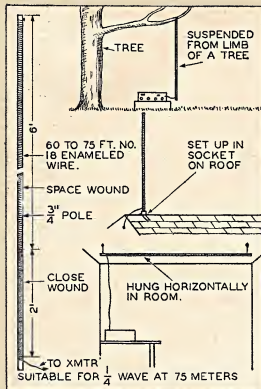
The tool maker easily solved the problem with a hand operated thread-chasing tool as shown in Figure 1.

A worn-out mill file about 1" wide provides good material for this tool. The teeth should be ground off, and about 2" of the end thoroughly annealed, by holding at cherry-red heat for 15 minutes, then burying in lime or hot coals until thoroughly cooled.

Use a screw-pitch gauge of the correct size for laying out the teeth, which are carefully cut with a three-square die-sinker's file. If metric threads are required, and no metric gauge is available, a metric rule, if carefully applied, will serve. Be sure that the angle of the teeth conforms accurately to the pitch of the thread, as shown in sketch, and check

[Continued on page 166]

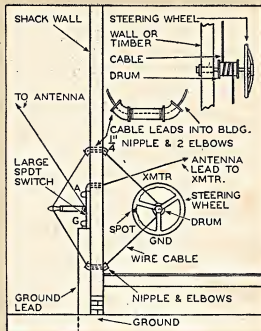




KINKS FOR

Emergency Antenna

THIS emergency antenna for receiving and transmitting is made from an 8-ft. bamboo fishpole and 60 ft. of No. 18 insulated wire. Bore a hole in each end of the pole and wind the wire on it spaced as shown. Connect the feeder directly to the transmitter tank or pi network, and tune the same as a Marconi job. —L. B. R.



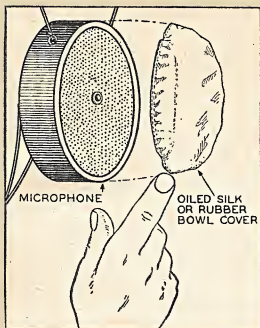
Indoor Antenna Switch

AN OLD steering wheel and wooden drum mounted as shown, operate a heavy duty SPDT switch outside the transmitter shack to permit grounding the antenna from inside during electrical storms. The antenna lead is run into the shack through a porcelain tube. Mark the wheel for gr. and ant. positions.

Old Transformer Use

AN OLD audio transformer with a good primary makes a filament lighting transformer for one or two tubes with low current drain. Immerse coil in hot water to soften wax, and push primary out with blunt stick. Unwind primary until about five layers remain, and tape. Wind on No. 14 enameled wire secondary, 25 turns for about 2½ volts.

THE HOME ELECTRICIAN

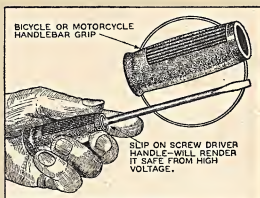
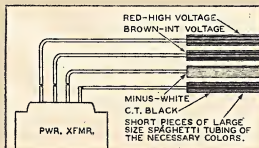


Microphone Protector

SENSITIVE microphones should be protected from moisture and dust whether in use or not. Oiled silk or rubber vegetable covers such as sold in five and dime stores for icebox use, do the job. Leave them on. They don't interfere with voice frequencies.—L. B. R.

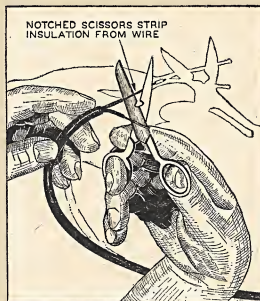
High Voltage Leads

HIGH voltage power supplies to a transmitter can be easily and safely identified by a color code, using colored spaghetti tubing. Slip short lengths of the spaghetti over the leads, using the code shown.



Safer Screwdrivers

YOUR favorite screwdriver can be made safer for electrical work by slipping a handlebar grip over its handle as shown. Some rubber cement applied to the inner surface of the grip will hold it permanently.—A. H. W.



Wire Stripping Tool

AN OLD pair of scissors can be easily converted to an insulation-stripping tool by filing or grinding notches into them as shown. Be sure to leave sharp edges on the notches. To remove insulation close the scissors lightly on the wire, and slide them along.—K. M.

CARPENTER'S TOOL BOXES

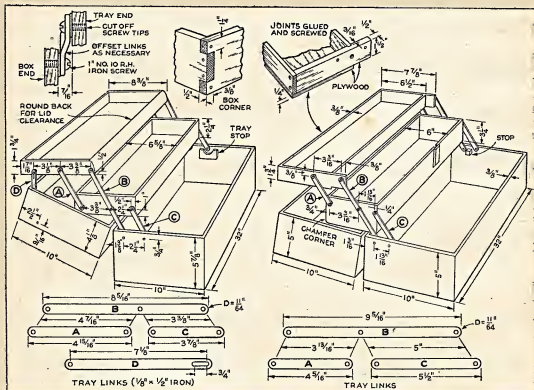


way to check the contents. As a result, when quitting time comes the mechanic hastily gathers up his belongings and trusts to his memory to tell him whether or not he has picked them all up, and not infrequently a tool is left out over night and lost.

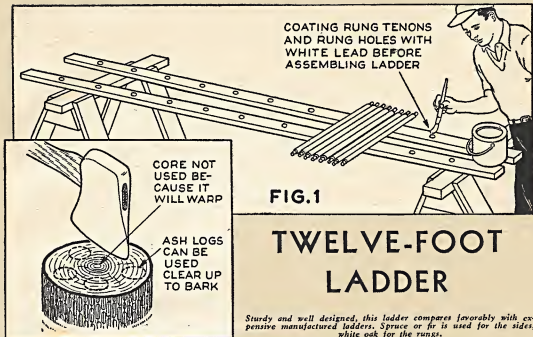
The tool boxes described here abolish all such difficulties. Trays move out on the level with a single motion, exposing every part of the interiors to view. Every tool has its separate stall, identified by a plain label. A glance shows instantly what is missing. Tools lie in a natural position, instead of being pegged up, thrust through holes, or held with turn buttons. They can be lifted out directly.

The kit is divided into two sections. One box contains the roughing tools, the other,

[Continued on page 168]



Left: The finished tool box. Bits, coping saw, chisels, etc., go in top drawer; drills, screwdrivers, planes, spoke-shave in middle; clamps, glue, extra plane blades, putty knife in bottom. There is also room for an additional tool such as a router, and supplies of nails, sandpaper and screws. Everything should have its place labeled. Right: Roughing box. Every tool is accessible.



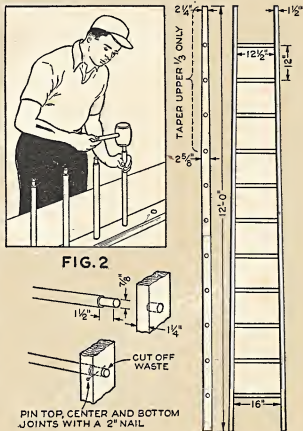
A SAFE, light-weight, easy-to-handle 12-foot ladder should be among the repair and maintenance tools of every home owner. Here is a proven design for building such a ladder and information on how to go about getting the best material to use for the job.

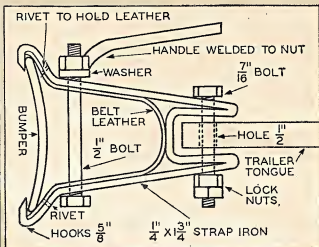
Since only well seasoned wood should be used and because well seasoned wood is hard to find these days, start collecting your material now and as you get it lay it away to season. Then when you need it, it will be ready for you.

When at your lumber dealer's, keep your eye peeled for two lengths of perfectly straight-grained, knot-free two-by-threes of either spruce or fir to be used for making the stringers. Perfect pieces of fir are readily obtainable. When you get a pair, have them mill dressed down to $1\frac{1}{4}$ " in thickness and lay them away on a flat surface in a ventilated garage or attic for at least six months. If you must lay them out of doors, shade them from the sun because lumber that is sun-seasoned is likely to crack.

Ash or white oak makes ideal rungs.

[Continued on page 170]





Trailer Hitch

THE neat, easily applied trailer hitch shown in the accompanying drawings clamps onto the car bumper without slipping or marring the chromium finish of new bumpers, as the jaws are lined with belt leather. There is no unsightly permanent attachment to detract from the appearance of the car.

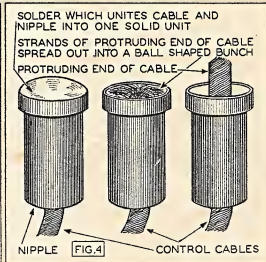
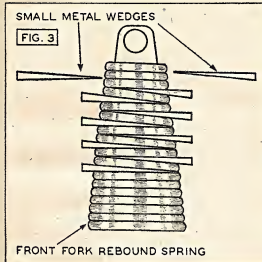
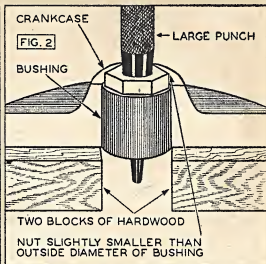
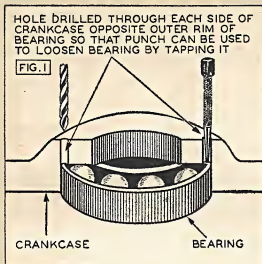
Spray-Painting Headlamps

IN AUTOMOBILE paint shops, the cone-shaped paper-and-cloth strainers so widely used have been found excellent for protecting headlamps against spray. A few slits 1" to 2" long are made radially around the circumference of the cone so the paper will spread to cover the entire lens. Then masking tape is used to fasten the cone in position, and to seal any slits that are spread considerably.



Sun Glass Substitute

PEOPLE with eyes sensitive to strong light who find that they have gone driving without their sun glasses may make a very good substitute by placing a pencil over their regular glasses so that it rests between the spectacles and the forehead.



Repair Tips For The Motorcyclist

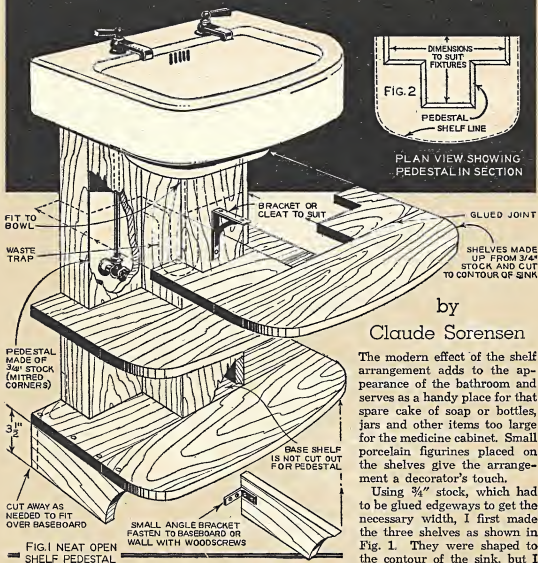
WHILE the removal of main bearings from the crankcase of a motorcycle is usually a job for an expert mechanic, Fig. 1 shows how it can be done both easily and satisfactorily by the average motorcycle owner, without outside assistance. A hole is drilled through each side of the crankcase above the bearing and the latter then loosened by punch-tapping through the holes. After the old bearing has been removed and a new one fitted, the two holes are plugged with tight-fitting copper rivets.

Fig. 2 shows how timing gear bushings can be removed from the crankcase. With hard wood blocks under the crankcase, a nut slightly smaller than the bushing is placed atop it. A large punch and hammer supply the necessary driving force.

The replacing of the rebound springs in the front fork of a motorcycle is usually quite a task for the amateur mechanic because the compressed spring is too short to be put in place. However, if several small wedges are

[Continued on page 170]

MODERNIZING THE



by
Claude Sorensen

The modern effect of the shelf arrangement adds to the appearance of the bathroom and serves as a handy place for that spare cake of soap or bottles, jars and other items too large for the medicine cabinet. Small porcelain figurines placed on the shelves give the arrangement a decorator's touch.

Using $\frac{3}{4}$ " stock, which had to be glued edgewise to get the necessary width, I first made the three shelves as shown in Fig. 1. They were shaped to the contour of the sink, but I cut them $\frac{1}{2}$ " narrower on their

exposed edges so that any drip from the sink skirt would not fall on them. I then made the risers and nailed them to the base shelf, these being $3\frac{1}{2}$ " high to allow free toe room.

The box-like pedestal was made from $\frac{3}{4}$ " stock also, shaped approximately as shown in Fig. 2 to conceal the waste trap and pressure valves. (Dimensions are not given as these will vary with the individual sink. In some instances valves will have been set so wide

IN COMMON with thousands of other bathroom lavatories, the appearance of the sink in my bathroom was such as to leave nothing to the imagination. However, its very nakedness inspired me to design and build the series of shelves pictured in Fig. 1 of the accompanying drawings. My object was not only to conceal the sink's running gear, but also to fill the space underneath with something useful as well as ornamental.

BATHROOM SINK



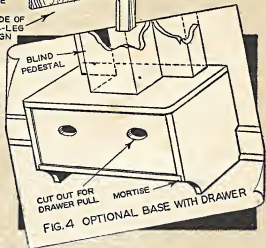
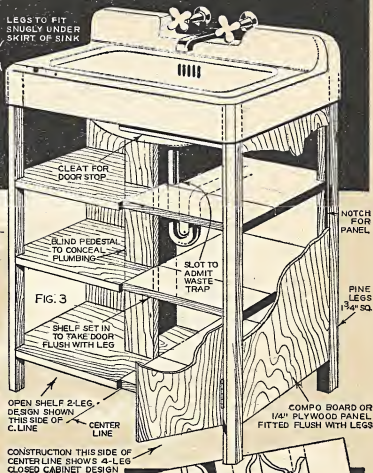
SIDE VIEW OF OPEN-SHELF TWIN LEG DESIGN. NOTE: BLIND PEDESTAL CONSTRUCTION AS SHOWN IN FIG. 1

that the pedestal may be built to full width of shelf—Fig. 3.) I scribed the pedestal to the wall and to the rounded underside of the sink bowl before mounting it on the base shelf. At this point I was glad I had not made the pedestal too short, as walls and floor were not true and it was necessary to cut it slightly off square to get a perfect fit on the base. The two remaining shelves were cut to fit neatly over the pedestal, spaced properly and nailed in place, nailing from the back side. Small angle brackets placed as shown on the inside of the lower base portion were used later to screw the finished job to the baseboard.

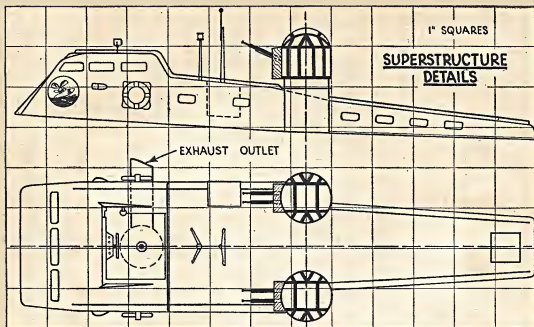
As the project was built so that it could be easily slid out from under the sink in case of plumbing trouble, I painted it in my workshop. Three coats of enamel were used, in tones harmonizing with bathroom colors, shelf edges in a contrasting shade for color balance.

Learning to my satisfaction that these lavatory shelves were a success, I realized there were many possibilities for variation

[Continued on page 174]



HOUSEHOLD



The squared drawing above gives the cabin details. Lay out the top and sides full size by the squares, then trace to wood.

[Continued from page 113]

moulding. The fixtures can all be made by the builder the running lights are $\frac{1}{4}$ " wood dowel. The bow light of $\frac{1}{8}$ " dowel and mast light of $\frac{1}{8}$ " dowel are turned down and mounted on $\frac{1}{32}$ " diameter piano wire strands, and cemented together. The port and starboard lights are painted red for port and green for starboard. The bow and stern flag staffs are round wood toothpicks trimmed, with cement knobs on top. The signal mast is $\frac{1}{8}$ " wood dowel with flat toothpick cross-trees and straight pin pennant top. The open throat ventilators may be cut from scrap balsa or purchased at any model store. Stock ones may be extended to proper heights with wood dowel. Incidentally the spot light and the six exhaust pipes on the transom may be cut from $\frac{5}{16}$ " hollow bamboo but pencil or dowel will do. The spotlight has a bent wire frame.

Since the entire cabin is demountable, it is necessary to cement $\frac{1}{8}$ " x $\frac{1}{4}$ " balsa on to the deck to receive and hold the cabin snugly. A rubber band can be attached from inside the hull in order

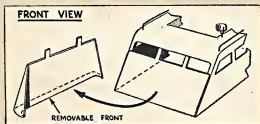
to hold cabin on under tension, also the rear hatch.

In order to force as much air as possible around the motor the front of the cabin must be made detachable as shown in photos. For this reason the cabin hatch has been cut and hinged, the windows are all open and the bridge is uncovered. The cellophane windshield will not interfere with the air circulation. It is advisable to study your cabin clearance when determining your motor installation and shaft length. As a precaution cut an additional hinged hatch immediately aft of the flying bridge to insure proper clearance, but this may not be necessary if your motor can be set further forward.

Well, it is just about time to paint, any reputable enamel or laquer will do. It is best to give the entire model a coat of gray, light for peace time or dark for war. Final painting may be done before or after assembly of parts. Paint the bottom a muddy red and boot topping green.

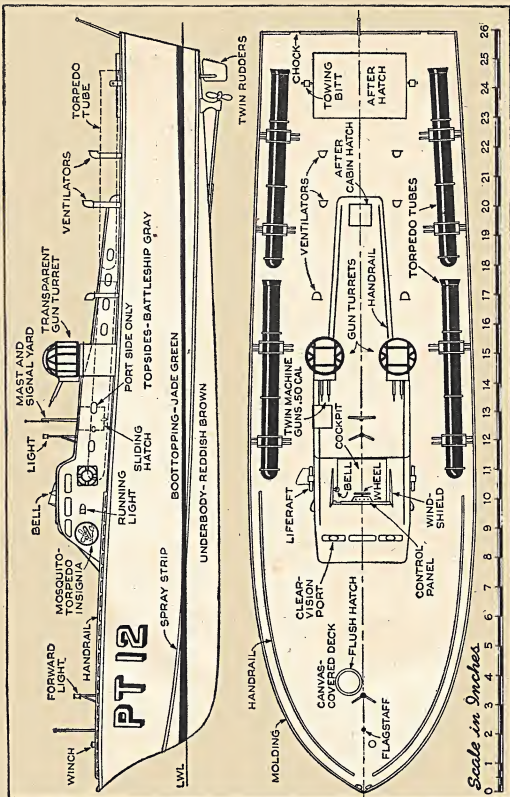
However, these final touches must be added, consisting of the footing rail of $\frac{1}{8}$ " square balsa with spokes of the same material which extend around the bow, the stern deck trim of $\frac{1}{8}$ " square balsa over the transom. The hand rail all around the cabin can be bent from $\frac{1}{32}$ " piano wire.

By the way, save two of those peppermint Life Savers from the pack you've been eating and cement them on either side of the cabin and they will blend with the stiff white lettering on the bow so well that you will bristle with pride.

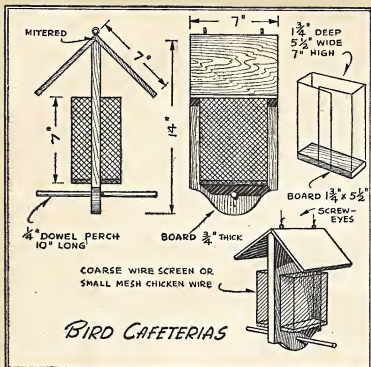


Front of cabin is removed as shown for sustained engine runs.

Large size blueprints for this boat are available from Fawcett Publications, Greenwich, Conn., at \$2.50. To secure them write to above address enclosing check or money order. Specify blueprint No. 330.



These scaled side and top views will enable you to locate the details correctly on the hull. The forward flush hatch may be omitted as it was on the original to assure a dry interior at high speeds. The rudders are omitted when a tether line is used.

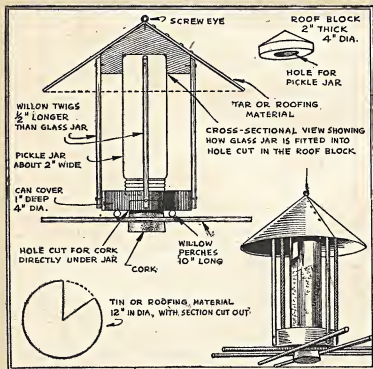


Cafeterias For Winter Birds

THESE feeding stations, hung with cord or wire from tree limbs or on a wire stretched from tree to house, will encourage the birds to stay about your place during the winter. Cardinals, Finches, Blue Jays and other songsters will often stay with you through the winter months if they can depend on your hand-outs. Titmice and Chickadees will be regular callers. One drawing shows a feeding station in which suet and meat scraps or crumbs from the table can be placed in small wire containers. The other feeder has a glass jar for sunflower seeds and ground feed which works automatically.

The table-scraper feeder consists of a pine board 3/4" thick, 14" long, and 7" wide; two roof boards each 1/4" thick and 7" square; a board 1/4" thick, 1 1/4" wide and 5 1/2" long for the floors of the feed baskets (two required); some screen or small chicken wire for the two baskets and a dowel 10" long for the perch. Finish down the two roof boards as shown, and miter or whittle the upper edges so that they will fit together. The upper end of the vertical board should also be planed down so that the roof boards will slope at the angle shown. Saw or whittle the lower end of the board in the shape shown, and bore a 1/4" hole 1 1/2" from the lower edge, to take the dowel perch which is

[Continued on page 176]



Loader For Single Shot Guns

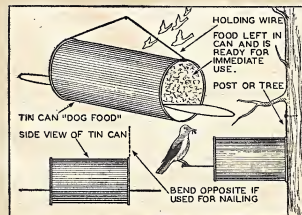
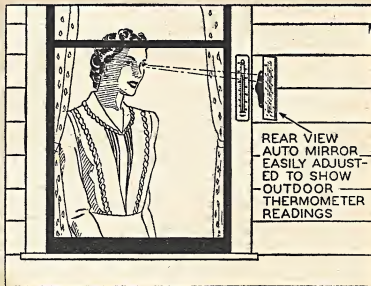
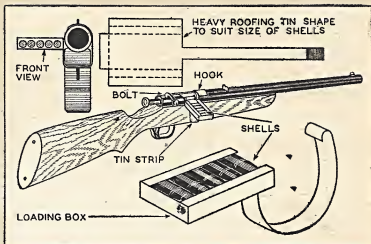
A HANDY loader to be used on single shot, bolt action rifles and shot guns, can be made with a pair of shears and a piece of heavy roofing tin.

Cut a strip 11" in length. Of this length, 7" may be 1" in width, while the remainder will vary, according to the size of shell used.

Wrap the slender end in cloth to avoid scarring the gun. Bend the end into a hook that fits tightly over the barrel, just in front of where bolt joins the breech. Bring the strip down the side, under the forestock and up the other side to the breech. From the edge bend the wide part of the strip horizontally from the gun.

With the shears, cut niches into the tin and crimp over so a pocket or "box" large enough to hold five .22's or three .410's is made. Other sized shells will take a different sized loader, of course. Turn top edges

[Continued on page 176]



Mirror For Thermometer

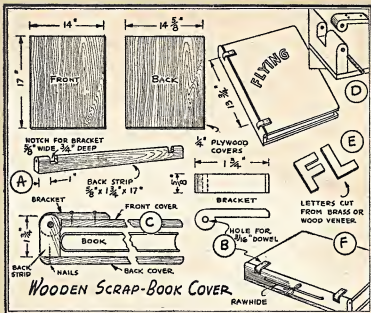
AN OUTDOOR thermometer may easily be read from inside the window with the aid of an automobile rear-vision mirror. Mount the mirror on the window frame beside the thermometer at a convenient angle.

Dog Food For Birds

HERE'S another idea for handing out rations to your feathered neighbors. Open a can of dog food in the manner sketched, and place it in a convenient spot for the birds. The winged population will love it.

WOOD COVER FOR SCRAPBOOK

by
G. E. Van Horn



DO YOU like to keep a scrapbook on your favorite subject, or a hobby book? It's fun to clip out pictures of the latest 'planes, adding to them from time to time to show the change in design. Snap-shots are always interesting. So are a number of other things, such as pictures and write-ups of entries in stock shows if you have a blooded calf, horse or pig. Keep your scrapbook in this handsome wooden cover, made from two pieces of birch or plywood and some scraps of wood. The complete cover is made up of the front and back panels, a back strip, two wooden brackets, two wooden dowels. The lettering on the front can be trimmed out of thin brass or tin, or cut out of thin wood veneer. Cut out and plane down the covers from plywood or birch $\frac{1}{4}$ " thick. The front cover is 14" wide and the back cover 14 $\frac{5}{8}$ " wide, both covers being 17" long. Slightly round the free corners of the covers, as shown. Make the back strip from oak or birch. When finished it is $\frac{3}{8}$ " thick, 1 $\frac{3}{4}$ " wide and 17" long, with the upper edge rounded with a plane and sanded smooth. At a point $\frac{1}{8}$ " from the upper edge bore a hole to take a dowel $\frac{3}{8}$ " thick. Bore the dowel holes in the ends of the back strip to a depth of 2" at each end. One inch from each end cut a notch for the wood brackets or hinges, making them $\frac{5}{8}$ " wide and $\frac{3}{4}$ " deep (A). Each of the two brackets (B) is whittled from a block $\frac{5}{8}$ " square at the ends and 1 $\frac{3}{4}$ " long.

One end is rounded as shown to form a hinge, the remainder cut away leaving a strip from $\frac{3}{16}$ " to $\frac{1}{4}$ " thick and $\frac{5}{8}$ " wide. Bore a $\frac{1}{8}$ " dowel hole through the rounded end. Whittle out two hardwood dowels which will fit snugly in the holes bored in the ends of the back strip. Where the dowels pass through the brackets they should be sanded down a little so that the brackets will turn easily on them. Now assemble the parts, tacking the back cover to the lower edge of the back strip, using small finishing nails and punching down the heads. Sandpaper the lower corner of the back cover where it is attached to the back strip. Attach the wooden brackets to the front cover using three small brass screws in each bracket. Make sure the brackets are fastened to the cover so that they will fit properly in the notches. Slip the dowels through the ends of the back strip, gluing the ends in place. A cross sectional view of the end of the cover is shown in (C), and the construction and assembly of the brackets and notches in (D). You can trim out the title letters from brass or tin, or from very thin wood veneer, first tracing them on paper with a pencil and then transferring them to the front cover after they have been cut out. Veneer letters should be glued to the cover and pressed down with a weight until dry. Metal letters can be attached with tiny round-head brads (E). If you wish to fasten the

[Continued on page 162]

"MY JOB IS MILES AWAY..."

but my HARLEY-DAVIDSON gets me there



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THOUSANDS of men in vital defense work live miles from their jobs. But they go back and forth quickly and at low cost on dependable Harley-Davidsons. More miles per gallon and minimum oil consumption conserve gas and oil essential for defense. Other advantages: power for faster getaway — easy to get through heavy traffic — no parking worries. Costs less than any other form of motorized travel — for everyday use — or for good times over week ends.

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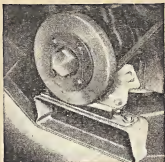
What's Your Car Trouble?

If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for a personal reply.

by Frederick C. Russell

Can you suggest anything to get rid of vibration in the engine of my car? This is only felt at lower speeds. J. L.

Oil the vibration dampener at the front end of the crankshaft. A plug is inserted in the oil hole.



After a ring job there has developed a bad metallic series of knocks in the engine. Timing has been rechecked. W. S.

The pistons are knocking on the old ridges around the tops of the cylinder walls. These ridges should have been removed when measuring the walls for out-of-round and taper.

What would cause the engine to seem dead for an instant when I step on the accelerator? G. F. N.

The acceleration pump of the carburetor isn't working properly.

Is there any way to keep a thermostat from sticking in a closed position? Bad thermostats have cost me a lot of money through overheating and loss of anti-freeze. F. F. E.

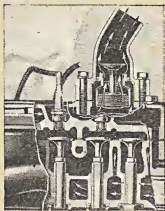
A bellows type of thermostat will stay in an open position if it fails.

I have no trouble starting the engine of my car, but it loads up. New carburetor jets haven't helped. J. J. W.

The screen in the hot air line control of the automatic choke is clogged with exhaust deposit. Clean this out and the thermostat will open the choke valve as it should.

Do you advise using engine oil in the gasoline when breaking in a new engine? F. R. L.

No. Use break-in oil in the crankcase. Oil in the gas may damage the automatic choke, a device which should never be lubricated.



Now and again when the car is parked on the shoulder of a road, or on the side of a steep driveway, the starter seems to engage by itself and make a racket if the engine is running. What causes this? W. M. B.

The anti-drift spring of the starter drive is broken.

We've traced an annoying engine noise to the fuel pump. What should be done? N. D. W.

The fuel pump is striking the vacuum pump diaphragm. Replace the rocker arm pin and the vacuum pump link.

HERE'S THE HOME YOU'VE ALWAYS WANTED!

NOW'S the time to start making definite plans for the house you've always wanted! Realize your hopes with the help of this grand new book of 40 beautiful modern houses: the 1942 HOMES AND PLANS FOR BUILDING, just off the presses!

Entirely new in content, this book—146 pages thick!—is filled with articles and photographs that will delight and fascinate you. Both interior and exterior views of each one of the 40 houses are shown. Besides pictures, there are floor-plan sketches, descriptive articles, and specifications on every dwelling—you get full details on every home!

Houses from all sections of the country, from the New England and middle Atlantic states to the Pacific coast, from Florida to Texas, are represented in price classes you can afford.



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Get your copy of HOMES AND PLANS FOR BUILDING No. 2 at your magazine dealer's or use the convenient coupon.

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Enclosed find 50 cents in check, cash, money-order, or stamps. Please send me at once, postpaid, a copy of the new HOMES AND PLANS FOR BUILDING No. 2.

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YOU Can Win CASH, Too!

ON PAGES 66-75 appear pictures of valuable prizes as they are to be given free to readers of MECHANIX ILLUSTRATED. You probably know all about the big contest by now, but you must have several friends who would like to know about the "Words-Within-Words" game and the valuable prizes, too.

There are enough prizes for all, so why not make a list of friends you know will be interested in this contest and who you believe have the skill with which to win?

By so doing, you may win one hundred dollars, cash!

See your friends personally, telephone them, or send them one of the coupons at the bottom of this page. Be sure they put YOUR NAME on the contest entry blank as sponsor.

That's all you have to do!

If one of your friends wins a prize, YOU, as his or her sponsor, will be eligible for a cash prize for having introduced a prize winner to the contest.

The person who sponsors the winner of the biggest prize will receive \$100. The sponsor of

the individual winning the second largest prize will get \$50. The sponsor of the winner of the third largest prize will get \$25. In addition, there are five more prizes of \$5 each.

That doesn't mean you have to sponsor the winner of the 1st prize (an Aeronca airplane) to win \$100. The winner of the first prize may not have a sponsor. The \$100 may be won by someone sponsoring a minor prize winner!

Sponsoring one or more of your friends does not injure your chances of winning a prize in the "Words-Within-Words" contest, but gives you a chance to take in a CASH PRIZE as well as one

of the big contest prizes.

All you have to do is let your friends in on this big contest. Tell them to put you down as their sponsor and you automatically become eligible for a cash sponsorship prize!

Be sure, though, that you, as sponsor, select entrants skillfully, sponsoring those persons you believe are capable of winning a prize in the "Words-Within-Words" contest. You may sponsor members of your family.

SPONSOR PRIZES

1st Prize\$100

2nd Prize\$ 50

3rd Prize\$ 25

In addition, there are five more prizes of \$5 each!

Dear.....

I think you can win an Aeronca airplane or a Crosley sedan free!

If not one of those prizes, a camera, a set of tools, a power lathe, a radio or one of a hundred valuable items. For details see the "Words-Within-Words" contest in the magazine MECHANIX ILLUSTRATED. It's now only 10c at all newsstands.

I hope you enter. If you do, I may win \$100 as your sponsor. Don't forget, put my name down on your entry blank as sponsor!

There are no catches in this contest. No slogans to think up. No essays to write. The highest score wins and I'm sponsoring you because I think you can win.

Your friend

Dear.....

I think you can win an Aeronca airplane or a Crosley sedan free!

If not one of those prizes, a camera, a set of tools, a power lathe, a radio or one of a hundred valuable items. For details see the "Words-Within-Words" contest in the magazine MECHANIX ILLUSTRATED. It's now only 10c at all newsstands.

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There are no catches in this contest. No slogans to think up. No essays to write. The highest score wins and I'm sponsoring you because I think you can win.

Your friend

Editor's Workbench Chips

[Continued from page 25]

stay home in the first place. Life's getting too complicated.

* * *

IN CLOSING, we hope—in fact, we're certain—that no MI reader was foolish enough to get into an hysterical state over the blackout preparations that immediately followed our entry into the war. It seemed to us that most of the citizens simply went hog-wild over the blackout rumors, rushing out to buy up all available quantities of black muslin, oil lamps, pails of sand, and so on.

Which is all right, of course, if you expect to be blacked-out for an eternal period. But even the worst pessimists have stated that our air-raids will be token raids at best, necessitating our being blacked out for but very short periods. And in our opinion, an hour or two in the dark would do us all a lot of good; it would help us to do some solid thinking.

On top of that, though, comes word from S. G. Hibben, of the Westinghouse company, to the effect that the partial blackout, in which a deceptive pattern of lighting is revealed to the enemy, is much more effective than the complete one. Complete darkness is harmful to civilian morale, Mr. Hibben says, increases accidents and hampers production. If the city is not all blacked, he points out, fake airfields can be built and lighted and the enemy completely crossed up.

It sounds pretty smart to us. We hate the dark anyhow.—The Editor.



William Sandrock, of 1221 Roscoe Street, Chicago, Ill., is the proud owner and builder of the *Snuffy*, shown above. He saw the plans and instructions for building the boat in *HOW TO BUILD 20 BOATS* No. 6, ordered a set of blueprints to make the job as simple as possible, and went to work. He built the boat without any help and made a good job of it, he tells us. The motor that Bill uses on the boat is a 9 horsepower job which drives it through the water like a speedboat.

We're glad Bill's getting so much enjoyment out of his boat. Blueprints are available for others who would like to build *Snuffy*. The price of the blueprints is \$1.50—their number is 955. If you'd like a set write your order to Fawcett Publications, Greenwich, Conn., enclosing check or money order. Speaking of money, Mr. Sandrock wins a \$3.00 Workbench award and a Workbench Certificate of Merit for the snapshot of that swell boat of his.

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New Products

[Continued from page 10]

All is not war with the Patent Office, however. Plant patent No. 493 has just been granted to Myron T. Barcafer, of Springfield, Ohio. It covers a new kind of ivy with fast growing tissue at the edges of its deep lobed leaves. The result is an ivy plant with beautiful crinkly leaves.

* * *

Several more German inventors have just been granted patents. Their patents No. 2,266,082, and No. 2,266,717, cover improvements on the now famous electron microscope. The first invention is a device for carrying on chemical reactions within the vacuum tube of the microscope. The second enables the operators to change the direction of the electron beam, and counteract for spontaneous shifts which sometimes spoil electron photographs. Uncle Sam can seize these inventions, too.

* * *

A new type of bicycle provides two driving units. One is the conventional rotation of the pedal crank by foot power, and the other is a hand operated rocking lever which is connected to the driving clutch. When the pulling gets to be a bit difficult for foot power, the hand lever, operating through an overrunning clutch, furnishes additional power to propel the bicycle. By means of foot pedals fastened to the lower part of the rocking lever, both the hands and the feet can be used to provide rocking energy, the conventional rotating foot pedal crank being inoperative in that case.

* * *

The Japs probably thought they had something when they turned out their little two-man subs. A Chicago inventor, Otto K. A. Frindt, may give them a new slant on such things, however. His patent, No. 2,266,545, covers a one-man, high speed torpedo-sub. It certainly sounds deadly. The pilot guides his streaking, needle-like craft at high speed toward the enemy ship. When he gets within a few hundred yards of his target an automatic device flips him into the water. The little death dealer hurls right ahead—into the side of the hapless enemy vessel. When it hits it doesn't just explode. It lets loose with a short barreled cannon that drives a torpedo deep into the vitals of the victim before it blasts it to bits.

* * *

Another invention that may help Uncle Sam get an even greater lead on the world's airplanes was recently granted patent No. 2,266,529. George H. Wright, of San Rafael, Cal., is the inventor. Generally speaking, the device might be termed an internally slotted wing. Instead of the usual type of wing edge slots, the Wright invention

[Continued on page 156]

Angle Your Models

[Continued from page 97]

figure out beforehand what you want the model to be doing in the finished picture, whether falling, diving, or sailing through space, then have her assume that attitude in a standing or lying position, and turn the resulting picture upside down.

When arranging the illumination, place your lights so that they will conform with the new angle of the picture after it has been turned around in printing. If the model is posing upright for a picture that will be printed upside down, and you want the lights in the finished print to appear as though they are shining up at her from below, place them above the model and let them shine down on her. Remember that it is not only the pose of the model that will be inverted, but also the lighting effect. In hair pictures, a light behind the model's head will make the hair stand out by giving it a halo effect.

If you learn to see poses as they would appear from different angles, you will be able to produce many of these startling effects. You can harness the law of gravity and make it do your bidding, even to the point of defying itself, and your pictures will never cease to be a constant source of amusement and satisfaction.

Spot-Flash Drama

[Continued from page 93]

to one side. The answer to the problem lies in combining instantaneous, synchronized flash illumination with spotlighting apparatus. Just screw the flash bulb to be used into the spotlight housing and make the exposure by means of this directed flash light.

Before shooting, it is best to observe the effect of the normal spotlight in its housing and to adjust its angle and distance to produce the most interesting result. All you need do then is switch the spotlight bulb with the flash lamp before connecting up the latter with your flash synchronizer extension.

The normal guide number or flash factor of your flashbulb will be altered by its use in the spotlight housing; it will be necessary to make a few test exposures at a higher number to avoid overexposure of the subject. (You divide the distance from the flash bulb to the subject into the guide number, or flash factor, to determine the f/ number that will give you the correct flash exposure.)

For eyeglass wearers who like to play badminton and ball games, a transparent plastic vizor has been devised.

So that school buses may be readily recognized, safety experts have advocated painting all such buses a standard color called "school bus chrome."

Never-Miss Kris!

[Continued from page 59]

day's work. But wait! The gunner's mate dashed forward with powder and wadding. Quickly they re-loaded. Crew members carried up another harpoon. The young Sampson on the steam winch, holding the whale by a heavy manila hawser, battled frantically to halt the animal's rush toward the floor of the sea. They'd hooked him, but the missile had not struck a vulnerable spot. Unless another harpoon found its mark, this game might continue all day.

By the time Khristiansen was ready to let go another round, the whale shot suddenly from the sea once more, raising a third of his huge bulk above the surface. He was no more than the width of a city lot from us when he reappeared. As earlier, he blew, nose-dived, emerged again, and set out toward the cow, towing the tug ahead faster in his effort to reach his lady. Gradually, though, the winchman pulled him in closer as the cow put on speed to escape her mate's attacker.

"Fast fisk," called out the Norwegian gunner, as though thinking aloud.

But not fast enough. As the whale steadied down a bit, Khristiansen crouched again, hand firmly gripping the long trigger. I think the beast must have been reading his intentions, for at that split-second, the whale charged in a mad rush across the bow. Rapidly, the cannon swung on its mount. As its great bulk hove into plain view, a second shot sent shivers trembling down the deck.

Was it a death blow? Surely the whale could not withstand two such terrible shocks!

But he must have been made of steel and defiance, for again the creature hit the surface, the loosened hawser backlashing on the winch and jamming. Endeavoring to keep the line taut, Captain Lund signalled full speed astern, and the *Gleaner* moved away. Again, seemingly uninjured, the humpback dove, reappeared, and made off toward the cow, pulling the ship slowly after him although the propellers were churning in reverse.

With two harpoons imbedded deep in its flesh, the second up near the head, Khristiansen picked up a hand lance. "Harpoons cost money," Lund grunted in explanation to me. Gradually, the two lines pulled the whale in alongside the ship. The gunner stood ready to send the lance home, when the whale touched the side of the vessel. Enraged, he bucked and surged, striking his huge tail against the ship with such force she trembled from gun-platform to after-rail.

"Into the heart . . . into the heart," the skipper called.

Khristiansen, with a mighty lunge, drove the lance home.

"That got him," shouted the gunner.

Not quite. Not quite. Instead of dying, as all expected he would, the whale rolled over, snatching the lance from Khristiansen's powerful hands. Then he sounded, taking line from the winch.

[Continued on page 154]



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Never-Miss Kris!

[Continued from page 153]

It seemed as though this battle never would end. With the whale's disappearance, it now was evident a third harpoon must be tried. Khristiansen dashed back to the gun platform, where his crew meanwhile had reloaded the cannon. When the stout-hearted humpback emerged once more, the man at the trigger expertly placed the projectile mid-way between the first pair. Not even a whale weighing 110,000 pounds, as this one later tipped the scales, could withstand three of these missiles. And so, exactly 90 minutes after the first shot, he perished, an unwilling victim for the trytops.

In accordance with international regulations, enforced by U. S. officers and supervised by the California Fish and Game Commission, each whale taken must be processed within 36 hours. To speed the work, Khristiansen ordered the catch pulled alongside, where it was made fast with chains. Then he stepped out on the carcass and inserted a large perforated lance into the body cavity that air might be pumped in to float it until the ship docked.

The 140-ton ship shortly headed homeward, the whale riding tail-first along the port side. Seven hours later the *Gleaner* hove into Humboldt Bay. Before sunup next morning, station workmen pulled the carcass up a long ramp into an enclosure where for a small fee visitors were permitted to view the imposing remains.

Cut-up started at seven in the evening, and was finished three hours later. Shortly after midnight oil was flowing from the pressure cookers into storage tanks, ready for shipment across the continent.

While the one Khristiansen got was a humpback, several other species disport themselves off the California coast. The grayback and sulphurbottom (known in the Atlantic as the Blue Whale) offer larger returns, not because of size but because they are present in greater numbers, and thus can be found more easily. The giant sperm, a toothed Cetacean, is the most highly prized of all. Superior to all is the head oil of the sperm. It runs free in the cranial cavity.

Although constantly on the lookout, whalers have not reported finding ambergris in several years. This waxy substance is a secretion of the

sperm, and floats on the surface, sometimes being cast up on a beach near whaling grounds. Ambergris is worth its weight in gold, being used in the manufacture of perfumes.

Khristiansen would rather get his harpoon into a sperm than any other whale, but like all whalers he'll take what he can get. He leaves the finback as a "last resort," because these fellows live generally a hundred miles out to sea, and take their meals of giant octopus and other delicacies on the bottom, perhaps a mile and a half down.

"Finbacks," the veteran gunner snorted after the humpback had been lashed alongside, and we headed homeward. "Finbacks! Don't let anybody tell you they can't stand those pressures."

He drew a tanned hand across the stubble sprouting on his broad, mustached face.

"Several years ago . . . that was before I was plying out of Field's Landing . . . I got a harpoon into a finback. Before I could pull that devil alongside, he carried out 7,200 feet of line . . . straight down!

"Yes, sir. Straight down. The ship moved ahead less than 60 feet during that plunge."

"Did you pull him up again?"

Khristiansen looked at me slyly.

"I'm a better man than any finback."

Whaling thrills and chills are an old story to this veteran seafarer. You may think the tales he tells are tall,

but they're gospel truth. Any experienced gunner will tell you that. His blood has run cold more than once. Khristiansen, true Viking that he is, doesn't spout words needlessly. He answers questions cautiously.

But he really was almost slapped into the sea by a dying whale . . .

It was another finback. No wonder he doesn't like the breed. He had harpooned a big bull, and after a long fight, his killer ship came alongside. The whale appeared to be dead. As is the custom when a whaler plans to move on ahead to stalk another, Khristiansen moved to the rail, held aloft a giant perforated needle and prepared to plunge the device into the quivering hulk. In another few seconds, compressed air would have flowed through those outlets, pumping up the carcass so it would float until the ship returned.



Never-Miss Kris!

A flag shortly would have flown from the whale's back, marking it as the property of that particular crew, and no other.

Then, as the silent picture titles used to say, came the deluge.

Heaving in a mighty death turn, that finback threw his eighty-ton bulk clear out of the sea and struck the ship alongside Christiansen with his wing-like tail. So hard did the blow fall, the tail slashed a notch in the mast. As he reared, he died. And with a final blood-chilling hiss, the whale fell back into the sea.

He missed Christiansen by a whisker!

Whether Christiansen really is the last of a long line of whaling gunners to roam the sea in quest of the valuable prizes under Uncle Sam's flag depends. It depends upon the length of the war, and its outcome. Upon markets after the war and discovery of synthetic oil and new compounds of natural oils. Upon public taste for the products requiring whale oil.

Probably whale oil will find a ready market so long as there are whales. It is widely used as a base for costly soaps and face creams. Tanners need it to prepare hides. It is the finest known lubricant for expensive watches and other delicate mechanisms. Glycerine is made from whale oil and glycerine is vital in the tempering of steel for the big guns we need for victory.

Recent figures indicate America possesses a vast reserve of this valuable product. But the stock is diminishing rapidly under the impact of war. Foreign supplies no longer are easily available!

Christiansen, an adopted son from the old world, is Uncle Sam's sole source of a sure supply. Not large, but sure. The law permits him to hunt only 184 days a year.

But you'll find him prowling the Pacific every one of those days. With luck, he'll bring ashore 3,500 tons of blubber this year. As the blubber boils in the steam pots, he will be wallowing through an off-shore fog, hoping the mists will lift and give him just one good shot before night shadows fall upon the Pacific.

Kris needs but one shot.

Pronounced toughest of farm animals, some British pigs are said to sleep through air raids, even when roofs overhead are wrecked.

Wood kept dry, say Government scientists, is a permanent building material; there is no true "dry rot," and fungi cannot grow in wood containing less than 20% moisture.

The electric eye is being used to perforate postage stamps.

America's skunks and muskrats are unknown in Europe, except in zoos.



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Piston Rings

[Continued from page 108]

It is then drilled and tapped for the clamping screw as shown in Fig. 10.

The loading sleeve is made from a piece of cast iron (there may be a suitable piece in your scrap box). First knurl it as in Fig. 11 then bore, Fig. 12, and cut off. Fig. 13 pictures the completed piston and ring assembly for the small steam engine illustrated at the beginning of this article. Fig. 14 shows the various parts of the fixture while Fig. 15 shows the split rings being closed and loaded into the sleeve, which is then slipped over the fixture as in Fig. 16. The clamping disk is tightened against the rings with the cap screw and the sleeve withdrawn. This leaves the rings tightly closed and clamped in a concentric position, Fig. 17. The fixture is again slipped into the spindle of the lathe where the rings are turned truly circular, Fig. 18. This is done with a keen tool and light cuts until the rings are brought to the proper dimension, as taken from the accompanying chart. This will be very helpful in getting correct proportions to the rings and the correct ring pressure against the cylinder wall. The example at the left of the chart shows a 1" diameter ring and is to be read the same as the chart, from right to left. With the variety of ring sizes dimensioned in the chart and the methods used in machining them shown in the photographs the modelmaker should be able to turn out a set of rings for almost any model he may have occasion to build.

Much consideration has been given the value of piston rings for model engines by experienced modelmakers and without exception they all favor their use. This is especially so amongst the men who build live steam locomotives (see article on page 65) and are faced with the problem of making their small piston valves steam-tight. Any blow-by here will be very evident in the all important pulling power of the little engine. Well fitted rings make these valves steam-tight and are well worth the time and trouble consumed in making them. The gas engine men too, who build model planes, speed boats and racing cars, all favor the use of piston rings, as there can be no leaky pistons in a gas job. High compression is all important here and to maintain top performance with the constant spit of white heat at the terrific speeds at which these engines run there is nothing to compare with the simple little cast iron piston ring.

New Products

[Continued from page 152]

provides for slots through the wing itself, with openings near the leading and trailing edges. In normal flight these openings are closed by means of sliding shutters. When slots are needed, the shutters slide back, permitting the air stream to pass through the wing.

Mother Earth Getting Plump!

[Continued from page 49]

and weighing 140 pounds. These attracting cylinders are mounted in concrete, in a building reinforced to eliminate any ground tremors or other factors which might affect the delicate instruments involved.

Air pressure and temperature in the room are maintained constant at all times.

As the mass of the earth is increased by shooting stars, the earth's gravitational pull at the surface is increased proportionately. The attraction between the steel cylinders measures the increase of the gravitational pull—and in this manner each ton added to Mother Earth's weight is marked up.

According to scientific findings recently reported to the National Research Council's Committee on the Measurement of Geologic Time by Dr. Fletcher G. Watson of Harvard University, at least one billion meteors or "shooting stars" strike the outer atmosphere annually, yet only about 1,000 are retrieved and weighed. Other stars hurtling to the ground are destroyed by their own generated heat in friction with thin upper air. These burned-up meteors descend earthward as ashes.

Astronomers at Harvard University have determined that "shooting stars" of second magnitude—ones discerned readily by the naked eyes—move 50 miles per second and have a mass of 10 milligrams. An ounce consists of about 28,000 milligrams. By like token, the aggregate weight of our daily "shower" of meteors is approximately 1,000,000,000 milligrams. Tolerance is made, in final computations, for a few "shooting stars" that weigh 250 pounds. Also, allowance is made for stars too small for telescopic observation.

"Matched" Picture Titles

[Continued from page 94]

advertisements for words and phrases. They may make up part of a sentence; often, entire sentences are usable. After you have found several, the others will immediately catch your eye. You can find dozens of titles in each newspaper.

Clip each title and trim it neatly with scissors or a paper trimmer. Do not try to classify them; merely drop them into a small box or envelope.

The secret of choosing a clever title is to lay your photographs out on a table, so that each can be seen plainly, then withdraw one title clipping at a time from the assortment. Read each title and if it "fits" one of the pictures, you will instantly know it. The decision is almost automatic. Replace the unused titles in the container for future use. Attach the titles in your album with either rubber cement or by covering them with adhesive Scotch tape.

Aerial Navies Of The Future

[Continued from page 45]

danger to their intrepid pilots than to the enemy.

The advent of World War No. 1 found all combatants in possession of rudimentary air forces totaling approximately several hundred planes. The machines were little different from those employed in the Balkan war and not much faster. Except in a few isolated cases armament was unknown and during the first phase of the war these planes were chiefly used for artillery spotting and general reconnaissance. Bombing was infrequent and, due to the inability of planes to carry more than a few small bombs at a time, largely ineffectual. Air fighting had yet to be developed at the close of the year 1914.

From 1915 on—the year in which air fighting came into being—developments were rapid both in performance and in armaments. The airplane was beginning to show its teeth and with each side striving to obtain command of the air, new types appeared in rapid succession. However, the increase in speed which marks this era was not so much due to any basic improvement in aerodynamical design as it was to the introduction of greatly improved and much more powerful motors.

Now, too, began the classification and division of planes into highly specialized categories most of which obtain today: Army cooperation and reconnaissance; pursuit and 2-seat fighters; medium, or day bombers and the heavy bomber.

The development of armaments kept pace with, if it did not actually surpass, the development of these planes. The introduction of a synchronizing mechanism permitting direct fire through the propeller disk and the development of a rotating flexible rear gun mount revolutionized air fighting as it then existed. Both these inventions remain in use today. Shell firing cannon appeared in late 1915 but although this type of armament cropped up from time to time its use was not general. Bomb loads grew as all-round efficiency improved and a fairly satisfactory bomb sight had been arrived at when hostilities ceased.

At the close of the war the airplane had become so important a military factor that, to take one isolated example, the R.A.F., which entered the war with a total personnel of less than 2,000 including pilots and other ranks, had 20,000 pilots and gunners in training alone when the armistice was signed!

Reconnaissance planes were doing about one hundred miles an hour and were armed with forward firing fixed guns besides the standard twin flexible rear guns; pursuit performance stood close to the 150 mile mark with extreme maneuverability and fire power usually confined to twin forward firing guns, although some types mounted one or more flexible guns in addition. Two-seat fighters and day bombers both approximated pursuit performance while the heavy bombers, to take the Handley-Page, Mark V/1500

[Continued on page 153]

REPRINTED FROM "SCIENCE & MECHANICS" FEBRUARY, 1941 ISSUE



MONEY MAKING OPPORTUNITIES

ALFRED HAMILTON, Editor

They Keep On Earning Money by Easy Electroplating



THE MAN who dreams of earning extra money, as much as \$50 or \$60 per week, need not dream in vain. Brush electroplating offers that opportunity. Here's what Jasper Brown of Chicago says: "I bought my electroplater to experiment with during my spare time. In a few evenings I earned the cost of the machine by plating jewelry, silverware, headlight reflectors, etc., for friends and neighbors. Now I have all I can do. I recommend this machine to all who want a profitable business."

Jasper Brown is headed for a business of his own, apparently. Restaurants, music stores, doctors, dentists and garages are only a few of the many sources of business for the electroplater who wants to hear more cash jingling in his pocket.

J. J. Wilson, Slidell, La., writes: "After I received my electroplater I practiced for about an hour. I made up four samples and went out after business. One of the large chain restaurants now has me do all their silverware."

Max Hemmert, Idaho Falls, Idaho, states: "I am now spending all my time in plating work. I purchased a brush plater last summer and have worked up a very promising business."

Frank Welde, Philadelphia, goes after garage business. He writes: "I electroplated a few brass strips for samples. I then showed these strips to different people and that's how I got plenty of jobs. I have all the work from a big garage. The owner gets 10% of what is charged his customers, and the rest goes to me for my work."

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Aerial Navies Of The Future

[Continued from page 157]

as a notable example, had arrived at the ten ton mark with four motors totalling 1,400 horsepower. Incidentally the Russians had a four engined bomber as early as 1915. This was the famed "Ilya Mourometz" grossing eight tons and carrying over three tons useful load including five machine guns and a crew of five. It was designed by, guess who? The same Igor Sikorsky quoted earlier in this article!

Toward the close of the war the German Junkers firm introduced all-metal construction and the influence of their successful low wing, all-metal cabin job persists to this day.

So much for the airplane as it emerged as a war bird from the 1914-18 holocaust.

The years between have been largely a matter of commercial development but the impetus provided by the demands of passenger airlines for larger planes, greater speed and better performance has played an important part in the production of the big bombers used so effectively in the present conflict. If the last great war may be taken as any criterion the effects of this war will be to speed up the turnover of types and thus bring the day of the really big battle-plane years closer than it might normally come.

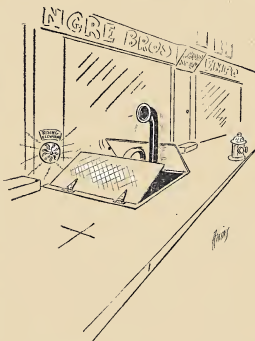
What then may we expect if the war continues? Firstly, much larger and heavier bombers: The geographical situation of Great Britain and her "arsenal," the U. S. A., naturally decides this. For the same reason medium bombers and attack planes will grow correspondingly larger and heavier. As to escort fighters, they will probably develop similarly but as multi-seaters and armed to the teeth with shell-firing and heavy caliber machine guns. Single seat fighters, regardless of geographical considerations, seem to be on the way out. This because as planes get larger and faster, as they tend more and more to employ bullet-proof tanks and armor plate in critical spots, their vulnerability to ordinary machine gun fire decreases. Shell firing cannon are becoming standard equipment for pursuit planes but the question arises: can a pilot operate such can-

non effectively besides taking care of all the other chores attendant on merely flying a 400 m.p.h. plane? It would seem more likely that today's pursuit type will give place to a much larger but equally speedy design with trained gun crews to take the burden of aiming and firing off the already overworked pilot's shoulders. It will be interesting to watch developments and see how soon this prediction is fulfilled.

Finally, giving full rein to the imagination, let us look into the future and try to visualize one of the mammoth battleplanes of ten or twenty years from today.

Here is one preparing for a ten-thousand mile routine patrol flight. Its enormous wings, more than 350 feet in span, still must lift a load of more than 70 pounds for each square foot of surface. Six huge folding propellers project above the training edge, three on each side of the circular, cigar-shaped fuselage. They are not yet in motion but rest folded and pointing like spears toward the tail. There are no signs of guns to our surprise, but a careful scrutiny betrays the seams where sliding fairings cover the retracting gun turrets. Beneath the huge dull, white belly of the ship the traps to the bomb bays are slowly opening, and while we stand and watch, what appears to be an unending train of bombs is run up and the deadly cargo swiftly and noiselessly drawn into the bays by internal pneumatic hoists. The bomb traps slowly close, leaving no visible seam to indicate that they do in fact exist. The commanding officer, a mutual acquaintance, happens to see us at this moment and invites us aboard to see some of less secret marvels of the great ship.

The first thing that strikes us is the mere size of the interior arrangements and the fact that the fuselage is apparently divided into innumerable compartments each separated by bulkheads and what look like airtight doors. This, the commander explains, is because the whole fuselage is designed to withstand the buffeting of heavy seas in the unlikely event of a forced landing at sea and also because the main fuselage is pressurized



Aerial Navies Of The Future

for extreme altitude flight. The wings, he points out, are not so pressurized but the crew members whose duty takes them to the various wing stations rely on oxygen helmets when flight conditions require this precaution.

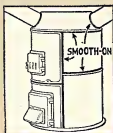
We visit one of the numerous gun turrets and inspect the mechanism which projects its for action as well as the guns themselves which seem much too large and heavy for an airplane, no matter what its size. The commander laughs and reminds us that this is a really big ship and that moreover it is built out of much lighter and stronger alloys than they ever dreamed of in the 1940's. We admire the pilots' cabin and are astonished at the small number of instruments it discloses until, later on, when we have looked at the navigators' cabin, the radio control cabin and the engineers' place of business, we realize that the pilots of this ship are merely the equivalent of wheelmen and take all orders direct from the commander on the bridge deck.

Passing through an air lock into the port wing we are shown one of the six engine rooms with its series of compression-ignition, oil-burning engines neatly coupled to the propeller transmission. Each engine room seems to be armor-plated as do the fuel tanks we have observed in the wing. Another feature which strikes us while inside the wing is the commander's landing amphibian made fast to a launching trapeze. Although a comfortable ten-passenger plane of conventional design it seems lost within the vault-like trusses of the wing. We are told that these planes—there are two of them, one in each wing—are used for commuting to land when the business of the moment does not warrant the cost of landing and taking off the big ship and also for speaking and examining suspicious surface vessels in mid-ocean.

A tour of the officers' and crews' quarters in the aft fuselage winds up our tour of inspection and, on terra-firma once more, we watch the crew go aboard as we move away from the vicinity to avoid being knocked head over heels by the propeller blast when the ship taxis away for the take-off. All six propellers have now unfolded and are gently revolving. The ship's siren blasts a sharp warning—the propellers come to full life and, taxi-ing slowly to the point of take off the ship soon turns and is off and away. As it turns back low over the port we note that now the flaps have been withdrawn the wings seem absurdly small for so huge a craft. Only four of the propellers are now turning—the outer ones are folded and motionless as they point, spear-like once again, toward the tail.

Paint industry experts suggest a good house number sign; clean and paint with white or light color a heavy, flattish boulder, add house number in black and set stone near sidewalk.

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Run 'Em With Steam!

[Continued from page 65]

or track width of 2½ inches is just right."

The 2½ gauge, explains Mr. Shattock, takes up more layout room, but you get a very spectacular effect from the bigger rolling stock, and you can really go to town putting in detail.

Continuing his discussion of the 2½ gauge, he says, "We use a scale of 17/32. That seems like pretty tough calculating, but a fellow live steamer in the Golden Gate Live Steamers fixed us up with a chart of scale sizes, and it's really not so difficult. Some beginners look at that 17/32 scale and say, 'Oh well, that's just the same as a half-inch to the foot.' But I tell 'em, 'No it isn't, brother. If you want accurate detail, stick to your scale.'"

Vic Shattock is employed in the Oakland yards of the Southern Pacific Company. He's not a locomotive engineer, but he's been working with locos for years and could take one apart and put it together like nothing. In fact, he knows locos so well—the real insides of them—that he takes the actual blueprints which the SP railroad loans him, and uses them in the construction of his models.

He ran into one great difficulty in building the fuel burning system: naturally, he couldn't use heavy fuel oil. So he invented a very practical fuel feed system of his own to handle alcohol. The next problem was to get a firebox that didn't operate like a ten-cent motorboat made in Japan. For this, he invented a burner that is remarkably similar to the locomotive firebox, even though it uses only alcohol! It's good enough to patent, but Mr. Shattock is content to keep his hobby strictly on the non-commercial side.

Mr. Shattock's live steam locos include a yard switcher, a couple of Mikados, a Pacific passenger type, and a light freighter. He's working on two new ones, and is seriously considering turning out an AC cab-in-front model, such as the SP uses in the mountains for its heavy freight trains.

His basement, like that of any other model railroad fan, is lined with right-of-way. He's built up a swell 3-track layout, with plenty of switching facilities, a workable turntable, water tank system, and of course plenty of tunnels and

bridges. And of course, you might know his basement is the hangout for all the live steam fans in the Bay district, including 30 or 40 Golden Gate Live Steamers—business, working, professional men who have the patience, enthusiasm, and craftsmanship necessary for the great art of building completely a real live steam loco.

"In building a real live steam loco," says Mr. Shattock, "you've got to be something of a boiler-maker, welder, lathe machinist, sheet metal worker, and mechanical engineer all in one. You've got to have a knack for grabbing on to bits of metals here and there and turning them to good use. You've got to tool an awful lot of parts. If you don't, you'll spend a fortune on a model."

He puts in about 1,000 hours on a loco, and spends about \$75. If you were to buy it, it would cost you \$1,000, the way he turns them out. So Vic Shattock has \$5,000 worth of locos of his own, besides some just-as-good rolling stock and track layout.

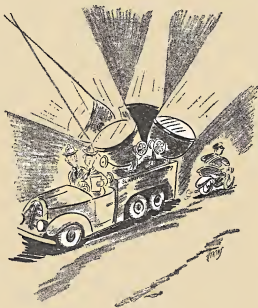
"And here's something to remember," says Mr. Shattock in concluding, "Work for accuracy in detail. About the only place I vary from the real thing is in using copper boilers. They don't rust. And of course, my fuel feed system is more or less my own, as is the way I feed the live steam into the cylinders. There are some things you just can't do with live steam models. But I work hard to get accuracy and realism, and it pays in the final

fun of having your live steam loco running your train for you."

Mr. Shattock has even equipped his locos with little steam gauges in the cab, which register steam pressures. And 120 pounds of steam on the gauge is 120 pounds of actual pressure. That's real live steam railroading!

Browning of evergreens in autumn is simply nature's way of pruning these trees, says an Agricultural Experiment Station scientist.

The Pacific Ocean surface is as warm as 75 degrees Fahrenheit in some places, but depths of the Pacific are always cold, mostly near freezing.



"It's a ticket—No tail light!"

Regenerative Receiver

[Continued from page 115]

or 14 enameled copper wire is used for the flat top. The lead-in should be about the same size wire, but rubber covered, so that it will be insulated from any part of the house that it may touch. It is best to go further than that and keep the lead-in away from the side of the house by means of insulators. Any splices should be well soldered or smoke soot may get in to the connections and cause noisy operation.

Now we are ready to operate the receiver. Connect the antenna and the headphones. Plug in all of the tubes, and a low frequency coil. Plug the line cord into a 110 volt AC or DC outlet and wait about a minute for the tubes to warm up. If you are operating from an AC source, and a loud hum is heard, it can be eliminated by merely reversing the line cord plug in the outlet.

It takes a little practice to learn how to operate a regenerative receiver properly. Turn the regeneration control condenser back and forth. You will notice a point as you turn from left to right, where a dull thud occurs. This is the point where oscillation begins. If you go much beyond this point, a loud squeal will be heard. You should avoid the excess oscillation causing the squeals. The region on the regeneration control between the dull thud and the loud squeals, is the operating position for locating stations. Now turn the tuning condenser. As you do so, you will notice several points at which whistles may be heard. These "birdies" are the locations of stations. Set the tuning condenser on one of them, and reduce the regeneration control to the point where the dull thud was heard. Just below this point of oscillation, broadcast stations are brought in loudest. Just above the point of oscillation, code or C.W. stations are brought in best.

After a little tuning practice you will find it easy to bring in stations from all over the world. Tuning for short wave stations is quite critical and the tuning condenser must be turned very slowly. Good DX operation depends upon a good antenna and very careful tuning.


Next month we will show you how to add amplification to this receiver so that it will operate a loudspeaker.

Answers to Craft Test on Page 125

- | | |
|------------------|---------------|
| A—Burring reamer | F—Square |
| B—Straight flute | G—Adjustable |
| C—Shell | H—Chucking |
| D—Straight shank | Expansion |
| chucking | I—Taper pin |
| E—Spiral flute | J—Counterbore |

For blackout use, one candlepower kerosene lamps have been invented.

The Grand Canyon, which is a mile deep, is rated the world's greatest example of erosion.



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The Battleship Is Sunk

[Continued from page 38]

a tragic national waste of manpower and money. This is a personal opinion, not a statement of fact. My opinions in this matter refer to all navies.

Germany's Navy has been practically swept from the sea, mainly because of the efforts of British aircraft. The *Graf Spee* was spotted and trapped by Fairey Seafox seaplanes catapulted from the *Exeter*. These little spotters found the *Graf Spee* first. They bombed and shattered the German pocket-battleship's intricate and valuable range-finding and gun-laying equipment before the British cruisers caught up with her. The Seafox planes were responsible for laying the very valuable smoke screen that shielded

[Continued on page 163]

(Correct Answers to Quiz on Page 78)

1. True.
2. True.
3. True.
4. False. A rock pigeon is a bird; a clay pigeon is merely a target.
5. True.
6. False. A settee is a bench.
7. True.
8. True.
9. True. The average adult has about 150,000 hairs.
10. False.
11. True.
12. False. If it crackles when you eat it, it's a huckleberry.
13. False. Plastic cars are lighter.
14. True.
15. False. Blue whales are heavier.
16. True.
17. False. Your big toe has two bones; the little toes, three.
18. False. Riboflavin is Vitamin B-2.
19. True.
20. False. The common cold is the most contagious known disease.
21. True.
22. False. Messages may be attached to the breast.
23. False. Experts believe whale milk is quite similar to cows' milk.
24. True.
25. False. United States alone has eight such microscopes.

Attention, MI Readers!

We will pay \$1 for each true-false statement which we find acceptable. Statements will not be acknowledged or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

Checks have been sent to the following: John H. Spicer, Ontario, Canada; Chester Marks, Ithaca, New York; Louis Stiniant, Windsor, Ontario, Canada; Douglas W. Brown, Nova Scotia, Canada; Paul C. Swaim, West Virginia; William G. Milnes, Jr., Manton, Rhode Island.

Kodacolor Album Prints

[Continued from page 119]

Obviously, when lighting conditions are less favorable—in winter-time, or in the summer under a hazy or dull sky—longer exposures will be required.

It is important, however, that the simplest box camera can be used for this new color process when normal, snapshot lighting conditions prevail.

This new color method is not recommended for indoor artificial light use. The film is balanced for daylight only. If the photographer wishes to make flash exposures, however, either to fill in contrasty shadows or to make pictures under adverse circumstances, the use of the blue 21B mazda flash bulb is suggested. Any of the blue superflash lamps or other blue coated mazdas should also prove practical. The suggested guide number or flash factor for the 21B mazda flash lamp is 56, when the open flash method is used. This means that the proper *f*/number will equal the guide number, 56, divided by the distance from the flash lamp to the subject.

The use of blue, "daylight" incandescent lamps with Kodacolor is not recommended.

Although Kodacolor has arrived, Kodachrome film will continue to be available in the 35mm and Bantam rollfilm sizes, and in the various professional sheet film types and sizes. Prints may be obtained from Kodachrome full-color transparencies by the Minicolor (for 35mm and Bantam) and Kotavachrome (for professional type) processes announced last August. The resulting prints have a white-pigmented acetate base like the finish of a playing card.

One precaution must be observed in handling Kodacolor as well as Minicolor and Kotavachrome prints. They must be kept away from direct sunlight and strong artificial light rays. The mounting of Kodacolors and Minicolors in albums is strongly advised.

Wood Cover For Scrapbook

[Continued from page 146]

scrapbook to the wood covers, bore small holes in the back strip, running a strip of rawhide or shoe-lace through the middle of the book and tying the ends at the back (F). After finishing and sanding the cover, stain it brown and wipe off surplus to show wood grain. This should be done before fastening the title letters to the cover. Carve your name or initials on the cover, and you are ready to show it to your friends.

Cotton felt, made without weaving, is proving suitable for bandages.

A high frequency radio tube used in television broadcasts was originally devised to kill rice weevils that spoil grain.

The Battleship Is Sunk

[Continued from page 162]

the British ships and then they carried out the gunnery "shoot" that resulted in the *Graf Spee* being put out of action. These facts were not widely publicized, but the flying men who carried out this work were publicly decorated at Buckingham Palace a few weeks later!

Germany has lost most of her much-publicized pocket-battleship fleet to British air bombing. The Fleet Air Arm has accounted for dozens of Hitler's U-boats.

The British Navy has suffered many staggering blows as the result of enemy air attack. The *Prince of Wales* and the *Repulse* are the most outstanding at present. The aircraft carrier *Illustrious* was put out of action for months by Italian and German dive and torpedo bombers. Many ships lost have been reported sunk by submarines, as was the *Ark Royal*, but with naval censorship being what it is, we have no idea how often Naval men decided to give credit to a Naval craft rather than to an aircraft. Naval history as presented to the public so far in this war has never been any too complete.

In two weeks of actual warfare, the United States Navy lost two battleships, three destroyers and several other lesser important surface craft to enemy aircraft attacks. That much of this loss may have been due to slackness on the part of those in command, as has been inferred by the Secretary of the Navy, carries none too much weight. The fact that American battleships have gone down as the result of enemy bombing cannot be denied, and to be fair, it has not been denied.

The point we are trying to bring out here is that we know for certain now that dive-bombers and torpedo aircraft CAN sink our finest battleships, whether these surface craft have air protection or not. The Big Navy supporters will naturally point out that with the coming of the submarine and the under-water projection of torpedoes, a new danger to surface ships was created, but that this invention and its general use did not justify the abolition of battleship building. They point out that certain measures were taken to provide certain protection to hulls and our Naval scientists went to work on efficient spotting devices to detect these submarines.

All this is granted, but it must be pointed out that the submarine is still a great menace to modern battle fleets, and that considering its cost and man-power required to man it, the U-boat still takes a great toll of vessels that devour millions of dollars for construction and maintenance.

A modern battleship costs about \$75,000,000 to build. Every ten or fifteen years another \$30,000,000 is usually expended to modernize it. We can wipe off \$100,000,000 every time we lose one battleship along with its complement of skilled officers and other ranks.

A modern dive-bomber or torpedo plane may

[Continued on page 164]

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The Battleship Is Sunk

[Continued from page 163]

cost anywhere from \$75,000 to \$300,000 and probably considerably less if they are ordered in large quantities. For the cost of a battleship, then, we can buy more than three hundred of the best torpedo bombers in the world!

The irony of all this is that the U. S. Navy didn't show any interest in torpedo-bombers until about 1938! By the same token, too, the British, who still put their sublime faith in a battleship navy, actually had a torpedo-carrying plane as far back as July, 1914, and that on August 12, 1914, Flight-Commander C. H. K. Edmonds flying a Short seaplane carrying a 14-inch torpedo from the H.M.S. *Ben-my-Chree*, took off from the Gulf of Xeros and near Injeh Burnu attacked and sank a 5,000-ton supply ship. In spite of this obvious success, the British did not make much effort to improve on the idea, and it was not until September, 1918, that H.M.S. *Argus*, one of the first naval aircraft carriers, was able to go to sea with a number of Sopwith Cockoon torpedo-carrying planes. By this time, it was obviously too late to do much damage, but the British did hang on to the idea and improve it. The old biplane Fairey Swordfish that carried out the Cape Matapan show does not photograph very well, and it looks like something out of a World War I exhibition, but it must be granted that the little 18-inch projectile it carries and delivers is more than our \$100,000,000 battleships can stomach. The new Albacore torpedo-bombers photograph better, but they carry the same torpedo and it will still sink battleships of the *Kongo* and *Bismarck* class and if we only have the initiative and foresightedness to recognize the torpedo bomber and its true worth, we can clear the Pacific of Japanese naval threat in a short time.

The tremendous cost of building and maintaining a modern surface Navy certainly does not seem justified in the face of current events. If a \$300,000 torpedo plane carrying a mere 500 pounds of explosive can blast our \$100,000,000 battleships out of the water, it is obvious we must face one of two vital facts:

First: If we persist in building a costly surface Navy, we shall have to change all present-day tactics and strategy. We shall have to redesign every ship so that it will be able to absorb the punishment handed out by dive and torpedo bombers. This means above all new theories of armament and the complete overhauling of the system of naval anti-aircraft defense.

Second: If we are convinced that we can no longer build surface craft to withstand the punishment enemy aircraft can deliver, then we must at once begin to replace our Navy with something else.

How can we replace the present Navy and be prepared for any future war?

At best, a battleship is simply an armed vessel.

[Continued on page 165]

Pilot Light Kinks

[Continued from page 117]

colors, can be used as colored jewels. Due to the short run of threads on the base, however, they can be threaded only through very thin panels. (C)

In cases where several pilot lights are mounted on the same panel, the light rays from the lamps can be confined to their respective jewels by housing them in baffles cut from tin cans as at D. Thus restricted, each lamp is prevented from interfering with the lighting of the jewels of the other lamps.

However, if it is desired to have a single jewel illuminated alternately by two or more lamps—each, of course, operating on a separate circuit—mount the lamps as shown at E. In such an arrangement, a colored jewel may be used with clear lamps. But if lamps of different colors are employed, the jewel must be clear or of a nearly colorless translucency.

The bottle caps referred to are commonly made of white or cream colored plastic either of which transmits colored light satisfactorily. Commercial jewels, made to fit switch and outlet plates, are stocked by electrical supply dealers in the red color only. Clear, opalescent, amber, green, or blue jewels can be obtained by dealers on special order.—J. Modroch.

Saving House Framing

[Continued from page 117]

these beams as shown at A. The width of the joists at this point is virtually reduced in direct proportion to the depth of the notch.

By just drilling holes through the joists, however, their width is left unaltered and their supporting strength maintained. See B.

Where notching must be done, restore as much as possible of the original strength of the beams by "bridging" the notches after laying the pipe as at C. Cut the bridge pieces to a length that will make a tight drive fit.

Year-Round Coaster

[Continued from page 122]

both, is made as shown, giving direct and effective action on the rear wheels. The latter should be, preferably, standard disk wheels 9-in. in diameter.

Runners of plywood are shod with light strap iron, and two wooden hubs give a wide bearing on the steel axle. A brass tube bushing reduces wear. Changing from runners to wheels is a matter of minutes. A lively paint job will make a smart and novel little vehicle.—H. S.

Leaves saved to form humus for the soil should be piled as wet as possible in an out of the way place, in broad, flat-topped fashion, to allow even decay.

The Battleship Is Sunk

[Continued from page 164]

A very complex and costly vessel. We must have ships and shipping facilities and by that token there is no reason why we can't build our Mercantile Marine vessels as armed merchantmen. We have to arm our shipping fleet in every war and the job usually takes months to complete.

A great deal of time would be saved and a great deal of money could be saved, if we adopted such a policy. Our naval patrol and defense work could be carried out by long-range flying boats. Our naval fighting job could be assumed by long-range fighters and torpedo planes catapulted from the well-decks of our armed merchantmen. The British are catapulting special Hurricane fighters from the decks of armed merchantmen today, in an effort to combat the threat of long-range German fighter-bombers.

It took Britain nearly two years to adopt this means of meeting the German air raiders at their own game. If the long-range fighter-bomber is that dangerous and its interception is that important, it is obvious that Germany has found the answer to the problem of how to conduct a war without a surface Navy. If Germany can play such havoc as she has, with a few submarines and long-range fighter-bombers, is it unreasonable to ask why we need \$100,000,000 battleships?

If we have long-range flying boats capable of 5,000-mile flight ranges (and we have) our naval air fleets can cover far greater areas than any surface fleet. If we have long-range fighter-bombers, we can deliver as much metal on the hulls of enemy fleets as can any cruiser flotilla. If we have suitable air bases and enough catapult ships, we can produce a "destroyer" fleet with more range, power and speed than any flotilla of "trouble-boats" of the dungaree Navy.

In other words, at less than one-third of the cost and upkeep of a surface Navy, we could produce an aerial fighting force, working in conjunction with an armed Merchant Marine, that could blast any Navy in the world out of the water within a few short weeks.

We saw the exit of the pikemen and the exodus of British bowmen. We have seen the glorious days of wooden ships and iron men. We know all about the cavalry charges of history. Many of us served in the slots and trenches of the last World War. All that has gone and passed on to the science of modern warfare. Let us not, then, fight what seems to be the honorable curtain call of the surface Navy. We must not blind ourselves to the facts.

They say the British Tommy saw the Angel of Mons in the last war and that the Frenchman was encouraged by the vision of Joan of Arc. Would it be out of place then to suggest that perhaps a few American soldiers at Pearl Harbor saw the spectre of General Billy Mitchell in the smoke on December 7, 1941?

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CRYPTORITHMS

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Every letter used in a cryptic problem represents a number. There is a different letter for each of the ten digits, counting from 0 to 9, or from 1 to 0 (10). When these ten different values are discovered, the key will appear as a ten-letter word or phrase, starting with the letter signifying either 0 or 1, as the case may be.

These equivalents, when discovered should be written in immediately all through the problem, and in the key order. That is, if you determine that a letter, say A, stands for number 4, you must immediately write 4 under every A in the problem, and write A under number 4 in the key row, to spell out the key word or phrase.

CRYPTORITHM No. 9. An Addicrypt. Key:
1 2 3 4 5 6 7 8 9 0

B, E N W, O N T, R U N.
M, U U S, R E T, R T N.

T N, O R O, O T O, E M E.

HINTS: Col. 11: Just T, a "carry" from col. 10. So T must be 1.

Col. 6: $O + R = O$. R must be either zero or 9.
Col. 3: $R + R = E$. Now, if R were zero the total would be either R or T, instead of E. So R must be 9. And that makes E, 8 (18)!

Col. 1: $N \times N = E$. 8.

Col. 10: $B + M = T N$ (14). The only unused digits that will add to 14, or 13, are 7 and 6. Which is E, and which is M? See col. 2!

How many of you can finish this one? I wonder.

CRYPTORITHM No. 10. A Multicrypt. Key:
1 2 3 4 5 6 7 8 9 0

F L E C K S O F
E A R
C A S A F N S A F
R E K N O L C A F
F C O O L O O F
F F R K C O R K R O F

HINTS: Note the F in the first column of each of the three Products. No digits except 5 and 0 will repeat themselves in the products obtained by multiplication by three other numbers, 1, 2, 3, 4, 6, 7, 8, 9. We see, from its other positions, that F is not zero in this example; so F is 5. Furthermore a few trials disclose that E, A and R are all odd numbers, and must stand in some order for 3, 7 and 9.

2nd multiplication: $FLECKSOFA = REKNOLCAF$. Knowing F is 5, we look at the very last operation; F times A gives RE, most likely including a "carry." Now RE can't be greater than 45 (5×9). But R is either 3, 7 or 9. So R must be 3. That makes A, 7; and E can easily be 9. Simple! Eh?

Col. 2 of the Sum: $A \times F = O$. ($7 \times 5 = 12$). So O is 2.

Col. 3 of the Sum: $S + A + F = R$. ($5 + 7 + 5 = 13$). We know we had "1 carry" from col. 2, so S apparently adds nothing to it. So S is 0 (zero). You can finish. Easy! Don't you think?

Solutions to Nos. 9 and 10 will be published in MECHANIX ILLUSTRATED for April. Address answers to NINE-HEX, care of MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

The key words for February were:

No. 7: Parking Lot. No. 8: March Winds.

Cutting Thread On Any Lathe

[Continued from page 133]

carefully with the thread-pitch gauge or scale, using a good magnifying lens, to detect inaccuracies.

Harden point of tool at bright red-orange in linseed oil; polish, draw evenly in gas or torch flame to a light brown, and quench in water. A suitable handle fitted to tang completes the job.

Set the stock in lathe chuck, supported by tail-stock center, and back it up for its full length, either with a bar of steel held in place by clamps, or by a follower rest adjusted to run at about the correct speed.

Arrange a tool rest, such as a regular wood-turning T-rest, or a bar of steel closely paralleling the work for its full length, at such a height that the top of the chasing tool, when on this rest, will come on the exact center line of the work.

Drench the work thoroughly in any good standard thread-cutting oil (or, if threads are to be cut in drill-rod or other tool steel, use the camphor-turpentine compound previously described in these pages).

Revolve the work at a speed of not more than 30-50 r.p.m., and hold the chasing tool firmly against it on the tool rest, using firm, even pressure. Start the tool at extreme end of the work, and hold it at such angle that the upper, or cutting edge is exactly in line with the center line of stock.

When thread-cutting by more orthodox methods, several passes are usually required, taking only 3 to 10 thousandths cut at each pass. With an hour or so of practice, however, such skill may be acquired with this chasing tool that most small threads, say up to 20 per inch, may be cut at a single pass, and finished perfectly at the one operation, the principle being that of the tap, which cuts a complete thread at one cut.

If two or more passes are needed, it is easy to set the tool firmly and accurately in the previous cut, applying pressure as the lathe is started; and the threading may be instantly stopped at any desired point by merely removing pressure from the tool.

Where numbers of short threaded rods are required, or where long lead-screws are wanted, the full "between centers" capacity of the lathe may be employed, and the long threaded rods afterward cut up as required.

Left hand threads are produced as easily as right hand, by merely reversing the angle of the cutting teeth on the chasing tool, and starting the cut at the left end of the work and letting it feed toward the right. It will be understood, of course, that this type of cutting tool feeds itself according to the angle of the teeth, just as a tap feeds itself as it is turned into a hole. Since it is not humanly possible to file all the teeth on the tool with absolute precision, the slight variations of the teeth result in more or less equalizing the teeth, and making a very smooth job.—Clyde Baker.

Know Your Bombs!

[Continued from page 64]

explosion will first experience a violent increase of pressure which may tear them to pieces and blow them far from the scene of the explosion. Those objects not shattered by and blown in by the pressure wave may later be pulled toward the center of the explosion by the weaker suction wave because of the longer time during which this acts.

FRAGMENTATION occurs when the bomb case is shattered by the explosion. Splinters from the case fly in all directions with initial velocities in some cases several times that of an ordinary rifle bullet, piercing brick and concrete walls and causing fatalities up to 200 yards.

In general, a brick, or reinforced concrete wall 12 to 14 inches in thickness, or a sand or earth bank two feet six inches thick, would be required for protection. Fragments of bombs would not affect the structural stability of buildings, but the danger from flying fragments would be greater on the first and top floors.

EARTH SHOCK. The maximum effect of earth shock occurs when a bomb with a delayed-action fuse penetrates a considerable distance into the earth before exploding. The shock is a wave of actual physical movement of earth radially from the center of explosion. The disturbance of the earth adjacent to the detonation is commonly known as "mining" effect. Structural damage from earth shock may be more serious than that resulting from blast alone. Any masonry or brick load-bearing wall buildings are likely to collapse when subjected to the heavy lateral loads produced by earth shock.

PRIMARY AND SECONDARY damage. For purposes of analysis, the damage caused by bombs may be divided into primary and secondary damage. Primary damage is the direct result of the impact and explosion of the bomb. Secondary effects are those resulting indirectly from primary effects and include the collapse of structure where members have been destroyed by explosion or displaced by blast or when falling debris has heavily overloaded undamaged members. The blast effects on non-structural parts of buildings, such as windows, doors, plaster, etc., are varied. The danger of flying glass would make it undesirable for children to remain in classrooms during a raid.

Protective measures will also depend upon the types of construction of buildings, the locations of buildings and the capacities of buildings to accommodate persons in relatively safe places. The general statements which follow merely point the way to the much more detailed and exact information which should be secured regarding each separate building.

From a consideration of types of bombs and their effects, it may be concluded that school buildings (except the relatively few five, six or

[Continued on page 169]

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Carpenter's Tool Boxes

[Continued from page 136]

additional tools for finishing. This makes carrying easier, and is especially handy where the tools must be carried up a ladder or boosted over a fire wall. The boxes fit well into the turtleback of a car.

Build the boxes of solid stock for sides, plywood for ends, tops, and bottoms. It is advisable to use hardwood for the ends, although firm soft wood will do. If ready-sized stock is used, the boxes can be assembled with $\frac{1}{8}$ " extra width, so that the lids can be sawed off and the edges smoothed. However, if a power jointer is used to thin down the side material, it is better to build top and bottom separately, and in any event it will be easier to get good material in narrower widths. The drawings show simple corner joints that are strong, locking from both directions. If a band saw is available, nail the parts together in stacks and cut the notches with it. Use casein or waterproof plastic glue, sizing the end grain and allowing it to dry a little before assembling. When a bottom is assembled, tack the lid frame in place on it before adding the plywood cover, ensuring a fit.

There is nothing complicated about building the boxes, but care should be taken to hold to dimensions, as the positions of the pivots and link irons have been carefully checked to provide working clearance. Locate the screw holes accurately with the point of an awl, then drill holes slightly smaller than the root diameter of the screw.

After drilling the links, ream the edges slightly with a countersink to remove any burr. Run the screws in tightly enough to eliminate play, while allowing for easy action. If they try to work out, dip them in acid, which will soon rust them in place.

Suggestions for tool cleats are given in the photographs. Most of them are simply strips of wood glued in place; but for the heavy tools a few shaped holders, glued and screwed, are needed. Letter paper labels and glue them where they will be visible when the tool is cut, but partially or entirely hidden when the tool is in place, and coat with varnish to prevent wear.—Edwin M. Love.

Old Mill For Garden Pool

[Continued from page 116]

Sand the whole mill down smoothly, and give it a couple of coats of thin shellac to seal the wood. Paint the bottom with asphaltum varnish or other preservative to prevent absorption of moisture and subsequent rotting. Any paint store will be able to supply this item. Paint the mill a light gray, with wheel, base windows, doors, etc., a darker gray, or use any color scheme that will blend nicely with the setting. The mill should be easily seen; that is, you don't want it to be camouflaged so it won't show up at all, but neither should it stand out like a sore thumb.

Know Your Bombs!

[Continued from page 167]

seven-story buildings in large cities) offer but little protection against a direct hit in demolition bombing. Where school buildings stand out prominently in relation to surrounding buildings they may constitute a prominent target. They may, therefore, be subject to special danger if they are mistaken for factories from great heights. The use of covered trenches, with all their shortcomings, may deserve some consideration.

BRICK OR MASONRY buildings of steel or reinforced concrete skeleton construction. Such buildings are those with steel or reinforced concrete skeleton carrying the floor and wall construction individually on each floor. The walls are carried by the steel or reinforced concrete skeleton. This type of construction is relatively safe except from a direct hit. Parts of the structure may be destroyed without causing a collapse of the other floors of the building.

Buildings of this type may be further subdivided on the basis of resistance to fire. Fireproof buildings use non-combustible materials for floors, doors, trim and roof. Semi-fireproof construction permits the use of wooden sleepers and wooden floors resting on a concrete slab, together with wood-trim doors.

In general, buildings of steel or reinforced concrete skeleton construction offer protection against most dangers other than a direct hit. They are much more resistant to collapse; the effects of bombs are more likely to be localized. Where the roof consists of anything weaker than a five-inch concrete slab, such buildings are subject to penetration by incendiary bombs.

BRICK OR MASONRY buildings of wall-bearing construction. In buildings of this type the floors are carried by the bearing walls, as contrasted with the type where the weight of the floors and walls is carried by steel or reinforced concrete skeleton. Wall-bearing construction offers little protection from the effects of bombing.

These buildings may also be sub-divided on the basis of their resistance to fire, depending largely on floor construction, whether the floors are of concrete, steel joist or wood joist, etc.

All portions of wall-bearing structures are extremely hazardous because of danger of collapse due to a direct hit, or from earth shock. The collapse of such a building is likely to be progressive.

BUILDINGS OF WOOD FRAME construction. Wood frame buildings offer but little protection, even against fragmentation.

BUILDINGS OF MONOLITHIC concrete construction. Monolithic concrete structures which are adequately reinforced against lateral strains have approximately the same safety as the reinforced skeleton concrete construction outlined above. Monolithic concrete structures not adequately reinforced against lateral strains should

[Continued on page 171]

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Tips For The Motorcyclist

[Continued from page 139]

used to stretch the length of the spring, the job
will be easy (Fig. 3).

When a nipple is merely soldered on a control
cable, the cable will usually pull loose in a very
short time. Using the method illustrated in Fig. 4
will make a connection that will last the life of
the machine. Push the cable through the nipple,
spread the strand ends, and flatten out. A cap of
solder then welds cable and nipple together in-
separately.—Ivan Stretten.

Twelve-Foot Ladder

[Continued from page 137]

If suitable stock is not available at the lumber
yard, a trip to the woods or a visit to a cord wood
dealer should produce a couple of short logs of
straight-grained lumber from which the rungs
can be cut. To determine the straightness of the
grain, split the logs with an axe (sawing is de-
ceptive).

Split out the rung pieces as illustrated in Fig. 1
and then roughly trim them down to size. Follow
the grain when trimming. If necessary, finish the
rungs to a slightly bent shape if the log splits
that way as the strength of a rung depends
mainly on its being cut truly "with the grain."

If oak is used, be sure it is white oak. Upon
exposure to the weather, red oak rots quickly.
Let the rung pieces season thoroughly before
working them.

In building the ladder, the dimensions given
should not be altered if lightness of weight and
good balance are to be combined with strength.
Reducing the top weight of the ladder, as is noted,
is accomplished, in addition to a gradual shorten-
ing of the rungs, by tapering only the upper third
of the stringers. To taper them for their full
length would weaken the ladder at its center.
Also, if the rung holes are drilled with a 1"
auger bit instead of the 7/8" size specified it will
weaken the stringers at these points, while re-
ducing the diameter of the holes to 3/4" will
weaken the rungs.

Drill the rung holes square with the surface
of the stringers by guiding the drill with a try
square or other guiding device. The slight angle
at which the rungs enter the holes due to the
taper of the ladder will not appreciably affect the
fit of the joints. A lathe can be used for turning
the rungs to size if the wood used is perfectly
straight-grained, but if the grain is slightly bent,
shape them with a spokeshave or chisel.

Since a ladder is normally exposed to the
weather at least part of the time, coating the
rung tenons and rung holes with a good white
lead paint before assembling will increase its
life by preventing moisture from entering and
rotting out the joints.

Assemble the parts as shown in Fig. 2.—J. Mod-
roch.

[Continued from page 169]

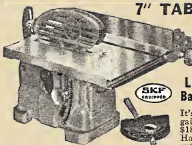
Buildings should be surveyed with reference to the relation of their locations to safety. In general, buildings in close proximity to defense plants, bridges, wharves, important railway junctions or other military objectives will present extra hazards, and, in some cases, possible abandonment should be considered in the event of recurrent bombings.

4. What Part of Your Building Is Safest?

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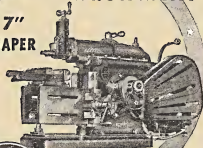
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Kidney Table And Bench

[Continued from page 132]

become real friendly when you're able to speak his language.

Now then, assuming that you have the lumber in your workshop, the patterns cut, the plans before you and the tools sharpened, then you'll want to get to work. Well don't stand there gaping at the plans, go ahead, measure out the table legs. Take a 12 foot length of the $2\frac{3}{4} \times 3\frac{3}{4}$ ", square a line and measure off $28\frac{1}{2}$ ". Make four lengths and cut along those lines. At one end of the pieces, measure $\frac{3}{8}$ " from each edge, and draw lines from one end to the other to get the shape in Fig. 2. Do the same with the other three legs. Now take the top end as in Fig. 3 and draw cross lines. In the center, bore down $\frac{3}{4}$ " with a $\frac{3}{8}$ " drill. That's for the dowel. Plane down to the lines, giving a dimension of $28\frac{1}{2} \times 2\frac{3}{4}$ " at the top end, and $1\frac{1}{2} \times 3\frac{3}{4}$ " at the bottom end. From the top end, measure down $2\frac{3}{4}$ " and draw a line. Mark off 2" from the top edge and run a line from that point to the corner as in Fig. 3. Cut or chisel that angle away. Now from the bottom end, measure up 1" and $\frac{3}{4}$ " across, then up again $1\frac{1}{2}$ ". Cut away that part. Do the same with the other three legs. Cut upper and lower leg braces (two each), set them in the notches you made in the legs, screw into place then saw along the angle of the leg.

Drill dowel holes, where needed (each pair of legs, and the underside of the table top). When that is done, glue the dowels in the legs first, then set the table top over them.

Cut the back support to size, notch the two legs where it will be mounted and screw into place.

The table is practically done. Lay it aside and work on the drawer. Cut all the pieces first, consulting stock sheet. Mitre the two sides at the back ends (Fig. 5), then cut $\frac{1}{8} \times 1\frac{1}{2}$ " from the outside ends. Nail the sides to the bottom (Fig. 5).

Now take the thin 3 ply wood and cut a strip $15 \times 2\frac{3}{4}$ ". Glue both surfaces thoroughly and snap into place where the cut out is. Place a clamp on each end and let dry for 24 hours. Cut the cleats for the drawer, and build the drawer slide to size. It's best to nail or screw each piece separately to the underside of the table top, "building them up," so to speak.

That's done with. Lay it aside and work on the bench. Cut all the required sizes as given in the stock list, following the drawings carefully (Figs. 6 to 10). Since the bench is a miniature table, follow the same routine used before. Brads will hold the shelf in place snugly, and you can fill the heads with wood filler.

Since the drawings are self-explanatory, we won't go into detailed instructions. For the upholstery job, you'll need a piece of cloth or light canvas, 24×18 ", some excelsior or kapok, several dozen small carpet tacks, and a piece of leather

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Plastic For Workshop Projects

[Continued from page 104]

desired form or shape, has the property of being waterproof, chemical proof, practically fireproof. The same results are obtained by using the Casca-mite plastic instead of Bakelite. The method is useful in building tanks, tubes, boxes, trays, frames or most anything you wish. Instead of winding the coated paper on a form it can be made into a pulp by macerating it with the liquid plastic, then shaping it by hand or with a mold into the desired design. As the plastic dries out it becomes lighter in weight, yet remains waterproof, forming a new and better type of "papier mache." In the making of models, such as a boat hull, it can be spread over a wood form with a knife or similar tool and will be quite hard and rigid after the plastic has set. It may be used for amateur sculpturing if desired.

A Plastic Tank for Photographers. The tank shown in one of the photos makes a useful and inexpensive auxiliary for fixing and washing films, and by providing a light-tight lid may also be used for developing. It will stand up under hard knocks and is less likely to become damaged than the molded Bakelite tanks commonly used.

The form consists of two thick wood disks of 4 3/8" diameter, separated on a dowel rod axle. It is advisable to coat the disks with hot paraffine, to which the plastic will not adhere after it has set.

Cut large sheets of absorbent paper (as opposed to hard or enameled paper) into strips about 3 1/2" wide, or whatever the depth of your tank is to be. The paper should be tested beforehand for stretching when wet. Ordinary newsprint paper is suggested. If it has a tendency to stretch when coated with the plastic, the latter must be applied to each strip a few minutes before it is to be wound onto the form, otherwise there will be bulges and each layer will not adhere tightly to its neighbors.

The plastic is made up according to the directions already given. To give it a black color, add a small quantity of lampblack. Spread it liberally on the paper and roll the latter onto the form until the wall of the tank is about 1/8" thick. Allow it to set and dry on the form overnight, then remove it and fit three heavy cardboard disks, each coated with plastic, into one end to make the bottom. A narrow strip of cardboard may be added around the top to make a bead or rim. Go over the tank carefully and touch up any spots where uncoated paper may be seen; then allow it to dry and set thoroughly and the tank is ready for use.

If you should desire to make a number of articles requiring long strips of paper, a convenient method is to purchase the "end" of a roll of newsprint from the press room of a newspaper. These are odd lengths, next to the core, which most pressmen do not use because of the comparatively small amount of paper on them. Such

[Continued on page 175]

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Modernizing Bathroom Sink

[Continued from page 141]

of the idea. For instance, a drawer compartment may be made of the lower shelf section, as shown in Fig. 4. As this area is below the waste trap the space may be profitably utilized as a drawer for extra towels and bathroom necessities. The sides of the drawer section are in one piece, with the lower shelf mortised into them. Drawer pulls should be of a type which do not protrude; lower drawer edges paraffined for easy sliding.

Figure 3 illustrates two ideas for using legs at front corners, to be fitted up tight under the sink skirt. This adaption is most desirable where the front edge of the sink is straight rather than rounded. If desired, legs at all four corners may be used to build an enclosed cabinet, with legs ploughed to accept 1/4" veneer sides. Door of veneer panel may be mounted with chromium hinges. Where a cabinet of this type is desired, it would not be necessary to build the blind pedestal to conceal the trap and valves. The outsides of the cabinet may be decorated after painting with attractive decals in desired motifs.

Kidney Table And Bench

[Continued from page 172]

24"x18". All these can be purchased at your local upholstery shop.

Before doing the upholstery work however, you should stain and varnish your table and bench. When the sandpapering job is completed, the table top must have a glass-smooth surface, with all holes filled in. Since the legs of the bench and table top are the only visible surfaces, particular attention must be given these. Let varnish dry for twenty-four hours, then rub it down well with powdered pumice and linseed oil. Varnish again and dry for another day. Give another treatment of pumice and linseed oil. This is just about the best combination for securing "professional" finishes. A third coat of varnish and rub down will finish the job. When dry, you can start the upholstery job.

Place some of the excelsior or kapok on the bench top, higher in the middle and tapering off toward the ends. Tack one end of the cloth underneath. Pull tight and tack the other ends. Work on each side now, for every tack you put on one side, put another on the other side, alternating each time. If the stuffing seems a bit thin in places, stuff some more in those places.

When you have it all tacked down without wrinkles, do the same with the leather. You may have to make slits along the edges as they fit along the rounded parts, but make them as you go along. When it is all tacked down, set the upholstery nails along the edge, spacing them evenly, about 3/8" apart.

Now your job is complete, so turn the table over to your wife and let her make the skirt. She'll need about two and a half to four yards of material, or shall we leave that to her?

Plastic For Workshop Projects

[Continued from page 173]

small rolls can be cut up into convenient widths on a band saw and are then ready for coating with plastic and rolling onto the forms.

Not only developing tanks, but all kinds and shapes of developing trays are easily made with this method.

An Ornamental Vase. This method of utilizing the liquid plastic is also useful in applying an ornamental surface to small boxes and many other articles. A cheap glass flower vase is used, also some crepe paper, either plain, colored or of the type coated with gold or silver bronze. The gold bronze paper gives a particularly attractive effect.

Tear the paper into small swatches as large as your hand, then coat each side of each piece with plain or colored plastic. Slap one piece over the bottom of the vase, molding it down over the sides. Cover the sides with three or four thicknesses of the paper, applied in this manner. Form it over the mouth of the vase and press it down on the inside for an inch or so. With the stiff bristles of a scrub brush gently tap the wet paper until it takes on a wrinkled texture and the torn edges of the paper disappear under the treatment. Stand the vase on a sheet of waxed paper for the plastic to harden.

When covering glass and metal with plasticized paper in this manner, be sure to use at least three thicknesses of paper. If the application is too thin it will be liable to develop checks on hardening and drying.

Paper Flower Vase. Coils of twisted-paper rope, about $\frac{1}{2}$ " diameter, can be purchased for a small sum from hardware dealers. By winding it on suitable forms and coating it inside and out with plastic, dozens of interesting and very practical articles can be made. The one illustrated is an attractive flower basket. Use a tin funnel of suitable size and fasten the end of the rope to the upper part of the spout with a rubber band. Wind the turns of rope closely together, fastening down the last turn with a spring clothespin. Coat the outside liberally with liquid plastic; when it has hardened, slip the basket from the funnel, close the opening at the small end with either a slice of cork or a wood disk and coat the inside with more plastic. Make up a little of the adhesive with less water than usual and with it cement the ends of two rope loops to the inside of the basket rim. These serve as a hanger.

Practical hot-dish mats are made in the same manner but with the rope wound in a flat spiral until it is of sufficient diameter.

Cuts for the Amateur Printer. Owners of small printing presses find that one of the greatest difficulties toward turning out attractive work is in a lack of cuts or engravings for printing decorative designs, drawings or halftones. At most any newspaper office one can secure used and extra paper "mats" from which stereotypes are cast with molten metal. These usually include in-

[Continued on page 177]

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Cafeterias For Winter Birds

[Continued from page 144]

nail or glued in place. Each of the two baskets is formed by bending a strip of coarse wire screen or fine chicken wire 16" long and 7" wide around the board bottom or floor. Hammer the wire over a sharp corner of wood block where it is bent at the corners, to make it neat and square. Tack the wire to the block around the edge, and fasten the overlapping edge of wire to the wire underneath, using small pieces of wire twisted through the meshes. Nail the roof boards in position, attach two screw-eyes as shown, and the station is ready to fill and hang up. By running the wire or cord from the feeding station through a small metal pulley attached to the tree limb or side of the house, and securing the other end of the cord to a nail driven in tree or building, you can quickly raise or lower the station when you wish to replenish it.

For the other station you will need a pickle or olive bottle about 2" across the end and from 6" to 9" long. Saw out a round block from a two-by-four board, which when finished, looks like the roof block in the drawing. Notice the edge is straight for a height of about 3/4", then tapers to a point. Bore or whittle out a hole 3/4" deep in the underside of the block, just large enough to snugly take the bottom of the pickle jar. Trim and peel eight willow sticks, each about 1/4" thick. The vertical four sticks should be 1/2" longer than the pickle jar, and are nailed at equal intervals around the edge of the roof block and to the can cover at the bottom. The tin can cover should be 4" in diameter and about 1" deep. Cut a hole in the bottom slightly smaller than the end of the pickle jar, and fasten a cork in the hole. On either side of the cork tack two willow perch sticks 10" long, driving the tacks through the bottom of the can cover into the sticks. Place two more stick perches on each side of the cork, tacking them to the upper perches at right angles. The roof is a round piece of roofing material or tin, 12" in diameter. Make a cut from the edge to the center of the piece as shown, and bend it to fit over the roof block. Most of the overlapping section can be cut away, and the edges tacked to the roof block. Fasten a screw-eye in the top of the roof block. To fill the jar, just remove the cork, upend the feeder and fill with seed or grain through the hole in the bottom of the can cover.

Loader For Single Shot Guns

[Continued from page 145]

of "box" over to form a half roof to keep shells from falling out. Close up end with remaining flap. When completed, loading box should allow cartridges to roll easily, yet be small enough to keep them from turning crossways.

To use loader: after firing, bring bolt back sharply so ejector will throw the empty case, tilt the gun to the left and let a cartridge roll into the breech, turn gun upright again and close bolt.

Plastic For Workshop Projects

[Continued from page 175]

teresting border designs as well as comic drawings and other useful subjects. Instead of using hot stereotype metal, the "casting" may be done with liquid plastic.

Hardwood blocks of the proper thickness should be used, to avoid checking of the plastic due to unequal contraction in drying. This can also be prevented by giving the face of each block two coatings of plastic beforehand, allowing each to dry thoroughly. The mat must be thoroughly lubricated to prevent the plastic from adhering. Coat each mat thickly with vaseline and allow this to soak into the mat paper over night, then gently wipe off the excess. Use less water in mixing the liquid plastic and coat it thickly over the prepared mat; then place the block and weight it down for six or seven hours. The block should lift from the mat easily and will only require trimming—to remove excess plastic which has seeped out around the edges—to make it ready for use.

If the cuts are to be made from coarse half-tone mats, or mats having fine detail, it is a good practice to first coat them with a rather thin plastic mix, which will fill in all of the fine lines without difficulty. After two or three hours, when the thin coat has commenced to set, apply the thicker plastic and cover with the block.

Christmas Tree and Other Ornaments. Less fragile than the usual glass baubles, ornaments made of plastic can be given odd and amusing forms by utilizing penny rubber balloons. Inflate each to the size desired, tie off the neck with a string and cover with about three coats of liquid plastic, allowing each coat to dry thoroughly. If the balloons have been lightly greased with castor oil beforehand, they can be deflated and withdrawn from the plastic shell. The ornaments may be further decorated with "paint" made with liquid plastic and a suitable color. As they are not inflammable they may be made to fit over lights.

Plastic Initials and Monograms. An extremely simple and easy way of making initials, monograms and decorative objects of similar nature is shown in the photos. A miniature cornucopia is shaped from a piece of waxed paper and partly filled with plastic mixed with as little water as possible. Close the large end by folding it over, then apply pressure so that the plastic is forced from the small end. With this improvised tool make initials and monograms, allowing them to form on a sheet of waxed paper. The heads of pins may be embedded in the plastic if desired. Make sure that the waxed paper remains flat until the work has set.

Uses of the new plastic are innumerable. Other suggestions that have been tried and found practical are shown in the illustrations. Many new uses will suggest themselves to the reader as he experiments with this useful material.



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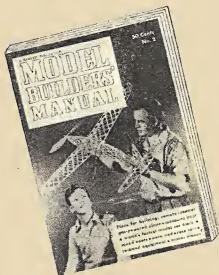
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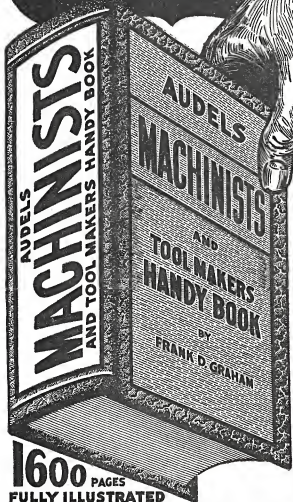
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"LIFE WAS SLIPPING THROUGH HIS ICY FINGERS!"



A true experience of special policeman FRANK HAHNEL, New York, N. Y.



"IT WAS STILL DARK...and bitter cold on the waterfront...when I finished my night patrol," writes Mr. Hahnel. "I had paused for a moment to say hello to a couple of friends when above the dismal sounds of the river came a piercing shriek and a heavy splash. Then there was silence.

"WE RUSHED FOR THE WHARF. I yanked out my flashlight and turned it on the water. There in the icy river 14 feet below we saw a man struggling feebly...clawing at the ice-sheathed pilings as the out-racing tide sucked him away from the pier.



"QUICKLY I DARTED my light about and located a length of line on a nearby barge...and a life preserver on an adjoining pier. In an instant the preserver splashed in the water beside the drowning man. Dazed from shock and cold, half clinging to the preserver and half lassoed by the line, he was dragged to safety. Thanks to my 'Eveready' flashlight and its dependable fresh DATED batteries the river was cheated of its victim. (Signed) Frank J. Hahnel"

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AERIAL NAVIES OF THE FUTURE

by Lieut. Douglas Rolfe (Hon.), Royal Air Force

(Illustrating by the author)

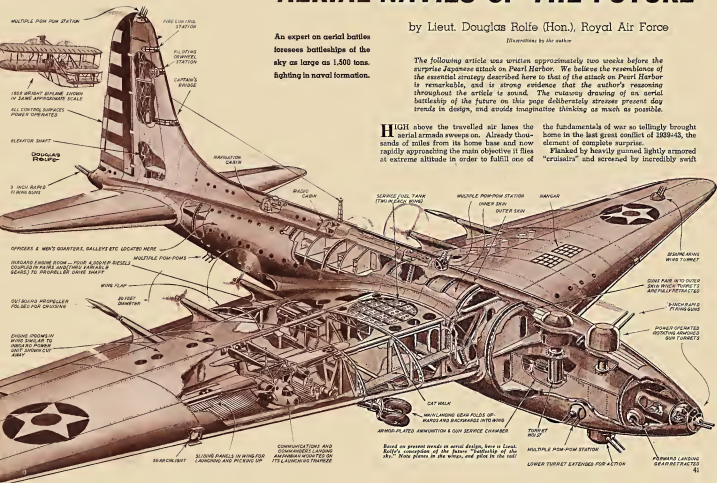
An expert on aerial battles foresees battleships of the sky as large as 1,500 tons, fighting in naval formation.

The following article was written approximately two weeks before the surprise Japanese attack on Pearl Harbor. We believe the resemblance of the essential strategy described here to that of the attack on Pearl Harbor is remarkable, and is strong evidence that the author's reasoning throughout the article is sound. The cutaway drawing of an aerial battleship of the future on this page deliberately stresses present day trends in design, and avoids imaginative thinking as much as possible.

HIGH above the travelled air lanes the aerial armada sweeps on. Already thousands of miles from its home base and now rapidly approaching the main objective it flies at extreme altitude in order to fulfill one of

the fundamentals of war so tellingly brought home in the last great conflict of 1899-43, the element of complete surprise.

Flanked by heavily gunned lightly armored "cruisers" and screened by incredibly swift



8,000 H.P.

1942 - WEIGHING 82 TONS AND SPANNING MORE THAN 200 FEET THE DOUGLAS B-19 IS THE WORLD'S MOST POWERFUL WARPLANE AND AN INDICATION OF THINGS TO COME

"destroys" hundreds of huge bombers, veritable battlewagons of the air, spread their wings in ordered ranks across the thin upper blue as far as human eye can see.

Accompanying this formidable array of fighting aircraft are troop transports, each with its complement of six hundred fully equipped armed men; carriers, literally bulging with amphibian gliders and "fifth-column commercial planes"; supply and repair planes carrying fuel, stores, spares and the necessary machinery for servicing and effecting minor repairs; hospital planes and still more transports carrying munitions, guns and mechanized equipment

4,000 H.P.

1937 - THE ORIGINAL "FLYING FORTRESS" BOEING'S GREAT B-17 BOMBER SPANNED 105 FEET, WEIGHED 16 TONS AND MADE OVER 200 MILES AN HOUR WITH FULL WAR LOAD

1,500 H.P.

1935 - THIS LATER MARTIN BOMBER STRUCK AN ENTIRELY NEW NOTE IN BIG BOMBER DESIGN - WITH A 71 FOOT WING SPAN IT WEIGHED 7 TONS

As plane power and size have increased by leaps and bounds in the last few years, so have aerially shown in this scenario, scaled drawings on these pages. The present one is unlikely to do more than "age up" our present-day aerial designs.

800 H.P.

1919 - TYPICAL BOMBER OF THE EARLY TWENTIES WAS THIS 4-PLACE MARTIN BIRPLANE - WING SPREAD WAS 71 FEET AND THE MAXIMUM SPEED ABOUT 100 M.P.H.

400 H.P.

sufficient to develop and exploit a concentrated attack from the air.

For this is no ordinary formation of bombers and protective fighters such as we are familiar with today. It is a completely equipped and self-contained expedition on its way to launch an utterly unexpected and paralyzing attack upon a far-off nation even now blissfully imagining itself at peace with the world and secure in its isolation and the not inconsiderable defensive air power it boasts.

Now they are but a few hundred miles from the shores of the doomed country.

From the flagship, where the commanding air marshal and his staff are gathered in the operations control cabin, a silent signal flashes

forth and immediately the entire fleet swings into a continuous circling movement at reduced speed while from the carrier ships drop innocent looking commercial planes cunningly faked to pass as friendly craft from bordering nations.

They drop rapidly and disappear in the direction of the objective.

All will lend shortly thereafter at widely scattered airports in the country scheduled for invasion. Some will remain to spread a net of spies and saboteurs but others will depart in apparent normal air line routine only to return to the mother ship and report what they have gleaned. Another signal flashes through the fleet—battle stations are manned. Ugly looking cannon now peer through the hitherto sleek skins of the battle planes and

1910 - THE WRIGHT MODEL "W" WHICH FORMED THE NUCLEUS OF UNCLE SAM'S AIR CORPS HAD 42 A TOP SPEED OF 40 M.P.H., WEIGHED ABOUT 800 LBS.

1917-18 - DESIGNED IN EUROPE BUT PRODUCED IN THIS COUNTRY THE D.H.4 WAS USED ON EARLY AIR MAIL ROUTES.

